

Recovery Strategy for the Bird's-foot Violet (*Viola pedata*) in Canada

Bird's-foot Violet



2019



Government
of Canada

Gouvernement
du Canada

Canada

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

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¹ www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

RECOVERY STRATEGY FOR THE BIRD'S-FOOT VIOLET (*Viola pedata*) IN CANADA

2019

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 Bird's-foot Violet (Viola pedata) in Ontario* (Part 2) and the *Bird's Foot Violet and Virginia Goat's-Rue*² – *Ontario Government Response Statement*³ (Part 3) under Section 44 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Bird's-foot Violet in Canada consists of three parts:

Part 1 – Federal Addition to the *Recovery Strategy for the Bird's-foot Violet (Viola pedata) in Ontario*, prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Strategy for the Bird's-foot Violet (Viola pedata) in Ontario*, prepared by H.J. Bickerton (2013) for the Ontario Ministry of Natural Resources⁴.

Part 3 – *Bird's Foot Violet and Virginia Goat's-Rue – Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources and Forestry (2014).

² The recovery efforts for the Bird's-foot Violet and the Virginia Goat's-rue are addressed collectively in a single government response statement (Ontario Ministry of Natural Resources and Forestry).

³ The Government Response Statement is the Ontario Government's policy response to the recovery strategy and summarizes the prioritized actions that the Ontario Government intends to take and support.

⁴ On June 26, 2014, the Ontario Ministry of Natural Resources became the Ontario Ministry of Natural Resources and Forestry.

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Part 2 – *Recovery Strategy for the Bird’s-foot Violet (Viola pedata) in Ontario*, prepared by H.J. Bickerton (2013) for the Ontario Ministry of Natural Resources

Part 3 – *Bird’s Foot Violet and Virginia Goat’s-Rue – Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources and Forestry (2014)

**Part 1 – Federal Addition to the *Recovery Strategy for the
Bird's-foot Violet (Viola pedata) in Ontario*, prepared by
Environment and Climate Change Canada**

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)⁵ agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Bird's-foot Violet and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Ontario Ministry of Natural Resources (now the Ontario Ministry of Natural Resources and Forestry) led the development of the attached recovery strategy for the Bird's-foot Violet (Part 2) in cooperation with Environment and Climate Change Canada. The Province of Ontario also led the development of the attached Government response (Part 3), which is the Ontario Government's policy response to its provincial recovery strategy and summarizes the prioritized actions that the Ontario government intends to take and support.

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 and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Bird's-foot Violet 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 and Climate Change Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

⁵ www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area⁶ be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

⁶ These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

Acknowledgements

The initial draft of the federal addition was prepared by Holly Bickerton (Consulting Ecologist, Ottawa). Additional preparation and review of the document was completed by Christina Rohe and Angela Darwin (Environment and Climate Change Canada, Canadian Wildlife Service – Ontario). This federal addition benefited from input, review, and suggestions from the following individuals and organizations: Angela McConnell, Lee Voisin, Ken Tuininga and Lesley Dunn (Environment and Climate Change Canada, Canadian Wildlife Service – Ontario), Manon Dube (Environment and Climate Change Canada, Canadian Wildlife Service – National Capital Region), and Vivian Brownell, Eric Snyder, Aileen Wheeldon (Ontario Ministry of Natural Resources and Forestry) and Clint Jacobs (Walpole Island Heritage Centre). Important background information was provided by several individuals that was useful in preparation of this report. Many thanks especially to Ron Gould and Graham Buck (OMNRF), Bill Draper (Ecoplans Ltd.), Mary Gartshore (St. Williams Nursery and Ecology Centre), Audrey Heagy (St. Williams Conservation Reserve) and Judith Jones (Winter-Spider Eco-consulting) for providing information and/or advice used in the preparation of this report.

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

Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the *Recovery Strategy for the Bird's-foot Violet (Viola pedata) in Ontario* (Part 2 of this document, referred to henceforth as “the provincial recovery strategy”) and/or to provide updated or additional information.

Environment and Climate Change Canada is adopting the Ontario recovery strategy (Part 2) with the exception of section 2.0, Recovery. In place of section 2.0, Environment and Climate Change Canada has established a population and distribution objective and performance indicators, and is adopting the Government of Ontario’s government-led and government-supported actions of the *Bird's Foot Violet and Virginia Goat's-Rue*⁷: *Ontario Government Response Statement* (Part 3) as the broad strategies and general approaches to meet the population and distribution objective. Only those portions of the Government Response statement pertaining to the Bird's-foot Violet are being adopted in this recovery strategy.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery strategy and Government Response Statement referring to protection of the species’ habitat may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however, whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

1. Species Status Information

The Bird's-foot Violet (*Viola pedata*) has a global conservation rank of Secure⁸ (G5; NatureServe 2014). It has been reported from 34 states in the United States (Appendix A); the national conservation rank in the United States is Unranked⁹ (NNR; NatureServe 2014).

In Canada, Bird's-foot Violet has been reported from fourteen populations across southwestern Ontario; nine are considered extirpated¹⁰ and five populations¹¹ are currently considered to be extant¹² (COSEWIC 2002; Bickerton 2013). The national

⁷The recovery efforts for the Bird's-foot Violet and the Virginia Goat's-rue are addressed collectively in a single government response statement (Ontario Ministry of Natural Resources and Forestry).

⁸ Secure: common; widespread and abundant

⁹ nation or state/province conservation status not yet assessed

¹⁰ population which was previously known to occur (i.e., for which there is a historical record), but that no longer exists.

¹¹ several sub-populations may be contained within one population

¹² still existing: not destroyed or lost

conservation rank for the Bird's-foot Violet in Canada is Critically Imperiled¹³ (N1; NatureServe 2014), and is listed as Endangered¹⁴ on Schedule 1 of the federal *Species at Risk Act* (SARA). In Ontario, the Bird's-foot Violet is listed as Endangered¹⁵ under the provincial *Endangered Species Act, 2007* (ESA).

In Canada, the Bird's-foot Violet occurs at the northern edge of its North American range. The Canadian population of the Bird's-foot Violet is estimated to constitute less than five percent of the species' global distribution.

2. Recovery Feasibility Summary

Based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility, there are unknowns regarding the feasibility of recovery of the Bird's-foot Violet. In keeping with the precautionary principle, this recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be technically and biologically feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Yes. One relatively large¹⁶, reproducing (i.e., flowering and setting seed) population is present on Turkey Point Provincial Park and St. Williams Conservation Reserve (Thompson 2006; Gould pers.comm. 2012). Ongoing management activities (e.g., prescribed burns) at this population have resulted in increased abundance, vigour and area of occupancy by the Bird's-foot Violet (Bickerton 2013), demonstrating that the species has the ability to re-establish under suitable conditions (e.g., increased light availability and bare ground within a given site). Three additional, smaller populations (Near Brantford, Forestville and Vittoria) have not been recently accessed to determine the availability of mature individuals, and Bird's-foot Violet on the Golf Course Savanna population is considered extant, yet has not been seen since 1996, despite survey and management effort (Bickerton 2013).

It should be noted that Bird's-foot Violet does not reproduce vegetatively and relies on long-tongued insects, primarily bumblebees, for pollination (Bickerton 2013).

¹³ critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as steep declines making it especially vulnerable to extirpation from the nation or state/province

¹⁴ a wildlife species facing imminent extirpation or extinction

¹⁵ lives in the wild in Ontario but is facing imminent extinction or extirpation

¹⁶ The total Canadian population at the time of the 2002 COSEWIC status report was estimated at 6,800 plants. The population at the Turkey Point Provincial Park / St. Williams Conservation Reserve is estimated to be equal to or exceed 6,500 plants (Bickerton 2013).

Though seed dispersal is not considered to be limited within sites (Thompson 2006), extant populations in Ontario are considered isolated pockets and separated from the main distribution in the United States (Thompson 2006), therefore loss of genetic diversity is a concern.

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

Unknown. The Natural Heritage Information Centre (NHIC) considers the co-efficient of conservatism¹⁷ for this species to be 10, meaning that it exhibits a very high degree of fidelity to a narrow range of ecological parameters (i.e., typically oak savanna habitat, which are rare and fragmented in Ontario) (NHIC 1995). In southern Ontario, less than three percent of the original extent of tallgrass communities (i.e., prairies and savannas) remain (Thompson 2006) and much of the remaining suitable habitat that is considered occupied by Bird's-foot Violet, occurs in areas that are becoming increasingly overgrown and unsuitable for this species (Bickerton 2013). On-going habitat management is required for this species to maintain the open conditions favourable to plant growth. Habitat management should continue to be advised by best available science and monitored for effectiveness. The feasibility of habitat restoration at the nine extirpated populations is unknown given the vague locality data of the records¹⁸ and the limited distribution of remaining suitable habitat.

The largest population (including sub-populations) in Canada occurs within managed natural areas (i.e. Turkey Point Provincial Park / St. Williams Conservation Reserve) and suitable habitat is likely sufficient to support Bird's-foot Violet at this population. However, the four additional populations occur on private land where recent access has not been possible or where habitat restoration has not resulted in the re-establishment of Bird's-foot Violet. It is therefore unknown whether restoration opportunities at all extant populations are available, or would be successful in ensuring sufficient suitable habitat to allow for a sustainable Canadian population over the long term.

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

Yes. The primary threats to Bird's-foot Violet in Canada include habitat becoming increasingly unsuitable due to altered disturbance regimes (i.e. a lack of natural fire) and habitat loss due to development and erosion (Bickerton 2013). In the absence

¹⁷ The Coefficient of Conservatism measures, on a scale of 0 to 10, the degree of fidelity (loyalty) that a plant species has to a particular habitat. Plants found in a wide variety of communities (i.e. generalists) rank at the low end (0-3), and plants with strong site fidelity and/or that tolerate little disturbance (i.e. specialists) rank at the high end of the scale (9-10) (NHIC 1995).

¹⁸ Bird's-foot Violet was last observed on the nine extirpated populations between the years 1890 – 1963 (Part 2) (NHIC; Bickerton 2013)

of natural fire, suitable habitat can be maintained using established techniques such as prescribed burns or canopy thinning. An improvement in habitat quality and an increase in abundance and distribution have been observed at the Turkey Point Provincial Park / St. Williams Conservation Reserve population since management actions (i.e. prescribed burns) were implemented in 2005 and again in 2010 to control succession and eventual shading of Bird's-foot Violet plants (Bickerton 2013). Threats posed by habitat loss from development and an increased rate of erosion due to sand extraction, could be reduced through habitat protection. Other known threats such as trampling and invasive species could be reduced, eliminated or avoided through management activities.

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

Unknown. Several proven techniques exist to manage habitat succession and restore suitable habitat and may be implemented where necessary through site management and stewardship actions. However, at least three of the five existing populations support very few plants (i.e. less than 10 plants), and it is not clear if recovery techniques will be sufficient or will occur quickly enough to ensure that all extant populations can be maintained. For example, the Bird's-foot Violet has not reappeared at the Golf Course Savanna population despite several prescribed burns in suitable habitat (Bickerton 2013), suggesting that although habitat can be improved, some small extant populations may already be irreversibly lost.

It should be noted, that though the species has not been seen at the Golf Course Savanna population for nearly two decades, the oak savanna habitat at this site is considered highly suitable for continued habitat restoration (Bickerton 2013), as little is understood about the longevity of viable seeds in the soil and it is possible the seedbank may yet germinate under favourable conditions and/or propagation (including assisted dispersal, cultivation or transplantation) techniques may be acquired.

3. Threats

In addition to the known and potential threats outlined in Part 2 - *Recovery Strategy for the Bird's-foot Violet (Viola pedata) in Ontario*, another potential threat to the Bird's-foot Violet is a decline in pollinator populations. Unlike other native Ontario violet species, the Bird's-foot Violet does not produce cleistogamous¹⁹ flowers (Bickerton 2013) and can only reproduce by seed production through cross-pollination (COSEWIC 2002). The Bird's-foot Violet is pollinated by long-tongued insects, primarily bumblebees (*Bombus* spp.) and certain butterflies (Kavanagh et al. 1990). A number of factors are suspected to be contributing to the decline in insect pollinator populations globally and in Canada,

¹⁹ cleistogamous: pertaining to or having pollination occurring in unopened flowers

including loss of habitat and food sources, diseases, viruses, pests, and pesticide exposure (Health Canada 2014). Notably, there is growing evidence to suggest that pesticides, including neonicotinoids, may be having negative effects on pollinator populations due to their toxic properties and persistence in soil and water (van der Sluijs et al. 2013; Cutler et al. 2014). Currently, the extent to which the decline in pollinator populations may impact the Bird's-foot Violet is not known.

4. Population and Distribution Objectives

Under SARA, a population and distribution objective for the species must be established. Environment and Climate Change Canada's population and distribution objective for the Bird's-foot Violet in Canada is to:

- Maintain, or where necessary and biologically and technically feasible, increase the species' current abundance and area of occupancy of extant populations in Canada.

This objective is consistent with the province of Ontario's Government Response Statement developed under the provincial Endangered Species Act, which outlines the provincial government's goal for the recovery of the species and summarizes the prioritized actions the government intends to take (see Part 3 for more information). The Government Response Statement for the province of Ontario lists the following goal for the recovery of the Bird's-foot Violet and Virginia Goat's-rue in Ontario:

The government's goal for the recovery of Bird's-foot Violet and Virginia Goat's-rue in Ontario is to maintain the provincial population of each species at, or enable natural increases to, sustainable levels and re-establish the species at sites they have historically occupied if feasible and appropriate.

As with the provincial recovery goal, emphasis on maintaining or increasing the current abundance and distribution of Bird's-foot Violet at existing populations is important since this species exhibits a very high degree of site fidelity and the likelihood of success in restoring the species at extirpated sites is largely unknown. Success of recovery strategy implementation will be in part dependent on the willingness of private landowners to grant access and allow restoration or management to all of the four populations that occur on private land.

Historically, natural and human-caused fire shaped and maintained the open habitat conditions favoured by the species (Bickerton 2013). Fire suppression combined with an absence of habitat management is currently considered the greatest threat to the Bird's-foot Violet in Canada (Bickerton 2013). Within the last decade, property management (e.g. prescribed burns) at the Turkey Point Provincial Park and St. Williams Conservation Reserve have resulted in an increase to the species abundance and distribution of this population (Bickerton 2013). In order to maintain or where necessary and biologically and technically feasible, increase the abundance and

distribution of Bird's-foot Violet at the Near Brantford, Forestville and Vittoria populations, where abundance of the species is presumed low and habitat degradation has likely had significant impacts, threats posed by fire suppression and habitat loss will likely need to be addressed. Similarly, the longevity of viable seeds in the soil is unknown and ongoing management and restoration activities are likely required at the Golf Course Savanna population in order to maintain Bird's-foot Violet at this location. Implementing Government-supported actions in the Ontario Government Response Statement, including the use of targeted surveys and monitoring, research to increase both knowledge about habitat management and seed bank characteristics and longevity and the development and implementation of site-specific management strategies (see Part 3) will benefit the Bird's-foot Violet at these sites and provide an improved understanding of the species survival and recovery in Canada.

Though Bird's-foot Violet was probably always relatively rare, occurring at the northern edge of its range, it was historically more widespread than its current distribution. However, it is largely unknown whether re-establishing extirpated populations of Bird's-foot Violet is feasible given the vague locality data (Bickerton 2013) and propagation techniques. As only a few, isolated populations remain, recovery also includes investigating the feasibility of re-establishing Bird's-foot Violet at historically occupied sites.

5. Critical Habitat

5.1 Identification of the Species' Critical Habitat

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. Under SARA, critical habitat is "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species".

Identification of critical habitat is not a component of provincial recovery strategies under the Province of Ontario's ESA. Under the ESA, when a species becomes listed as endangered or threatened on the Species at Risk in Ontario List, it automatically receives general habitat protection. The Bird's-foot Violet currently receives general habitat protection under the ESA; however, a description of the general habitat has not yet been developed. In some cases, a habitat regulation may be developed that replaces the general habitat protection. A habitat regulation is a legal instrument that prescribes an area that will be protected²⁰ as the habitat of the species by the Province of Ontario. A habitat regulation has not been developed for the Bird's-foot Violet under

²⁰ Under the federal SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

the ESA; however, the provincial recovery strategy (Part 2) contains a recommendation on the area for consideration in developing a habitat regulation. This federal recovery strategy identifies critical habitat for the Bird's-foot Violet in Canada to the extent possible, based on this recommendation and the best available information as of February 2015.

Critical habitat is identified for the five extant populations of the Bird's-foot Violet in Ontario (See Figure 1; see also Table 1) and is sufficient to meet the population and distribution objective; therefore a schedule of studies is not required. Additional critical habitat may be added in the future if new or additional information supports the inclusion of areas beyond those currently identified (e.g., new sites become colonized or existing sites expand into adjacent areas).

The identification of the Bird's-foot Violet critical habitat is based on two criteria: habitat occupancy and habitat suitability.

5.1.1. Habitat Occupancy

The habitat occupancy criterion refers to areas of suitable habitat where there is a reasonable degree of certainty of current use by the species.

Habitat is considered occupied when:

- One or more native Bird's-foot Violet individuals have been observed in any single year since 1995.

Occupancy is based on recent occurrence reports available from Ontario's Conservation Data Centre (Natural Heritage Information Centre) and Gould (pers. comm 2015), and allows for the inclusion of all five populations known to be extant. The timeframe is consistent with NatureServe's (2002) and conservation data centres' (e.g., Ontario's NHIC) threshold for considering populations to be extant versus historical (i.e., 20 years) and considers time to accommodate the uncertainty around the longevity of viable seeds in the soil.

Plants that are considered horticultural specimens or that are known to have originated from sources outside Canada and those clearly planted in landscaped settings such as urban gardens, are not considered to be occupying habitat for the purpose of identifying critical habitat.

5.1.2. Habitat Suitability

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

At existing locations in Canada, Bird's-foot Violet sites are typically dominated by Black Oak (*Quercus velutina*), White Oak (*Quercus alba*), or Red Oak (*Quercus rubra*).

Where a shrub layer is present, it is usually sparse, and may contain species such as Chokecherry (*Prunus virginiana*), Frost Grape (*Vitis riparia*), Staghorn Sumac (*Rhus typhina*), Wild Red Raspberry (*Rubus idaeus* ssp. *strigosus*), and Gray Dogwood (*Cornus racemosa*). Ground cover species include graminoids such as Little Bluestem (*Schizachyrium scoparium*), Kentucky Bluegrass (*Poa pratensis*), Hay Sedge (*Carex foenea*), Canada Bluegrass (*Poa compressa*) and Pennsylvania Sedge (*Carex pennsylvanica*) (Kavanagh et al. 1990). Of associated herbaceous species, Thompson (2006) found that the presence of Bird's-foot Violet was most strongly associated with Pilose Evening Primrose (*Oenothera pilosella*), Sheep Sorrel (*Rumex acetosella*), and Acuminate Panic Grass (*Dichanthelium acuminatum*). Other herbaceous plants associated with Bird's-foot Violet habitat in Ontario include Hawkweeds (*Hieracium* spp.), Field Pussetoes (*Antennaria neglecta*), Arrow-leaved Aster (*Symphotrichum urophyllum*), Canada Goldenrod (*Solidago canadensis*), Longbranched Frostweed (*Helianthemum canadense*), Plains Frostweed (*Helianthemum bicknellii*), Wild Strawberry (*Fragaria virginiana*), Wild Carrot (*Daucus carota*), Gray Goldenrod (*Solidago nemoralis*) and Bracken (*Pteridium aquilinum*) (Kavanagh et al. 1990). In the absence of periodic fire, the species requires occasional disturbance (e.g., prescribed burns or mechanical thinning) to maintain the open habitat (COSEWIC 2002; Bickerton 2013). The species may also occur in openings or along the margins of plantations or trails in wooded areas as well as in human-made habitats (e.g., hydro corridor).

Although there is nothing known about mycorrhizal²¹ soil fungus associations in Bird's-foot Violet (*Viola pedata*), mycorrhizal relationships have been found in many other species of *Viola* (Harley and Harley 1987) and it is therefore possible that this species is dependent upon the presence of a soil mycorrhizal associate (Bickerton 2013).

The biophysical attributes of suitable habitat (adapted from Bickerton 2013; COSEWIC 2002) for the Bird's-foot Violet typically include the characteristics below:

- Open areas (e.g., less than 25-60% tree cover)
- Bare soil or soil covered with a thin organic layer or moss cover
- Well-drained (dry) sandy loams and silty sands
- Oak savanna and oak woodland habitats (typically containing Black Oak, Red Oak or White Oak communities)

When the species occurs within a non-linear habitat, such as an oak savanna, woodland or forest edges, suitable habitat for the Bird's-foot Violet is currently defined as the extent of the biophysical attributes. In addition, a critical function zone of 50 m (radial distance) is applied when the biophysical attributes around a plant extend for less than 50 m.

²¹ The majority of vascular plants have mycorrhizae. The fungus assists in the absorption of minerals and water from the soil and defends the roots from other fungi and nematodes, while the plant provides carbohydrates to the fungus.

When the species occurs within a linear habitat, such as a hydro corridor (i.e., where there is no limit to the immediate extent of suitable habitat), suitable habitat is currently defined as the extent of the biophysical attributes up to 100 m from a Bird's-foot Violet in both directions parallel to the linear feature. In addition, a critical function zone of 50 m (radial distance) is applied when the biophysical attributes around a plant extend for less than 50 m.

In Ontario, suitable habitat for the Bird's-foot Violet is described using the Ecological Land Classification (ELC) framework for Southern Ontario (Lee et al. 1998). The ELC framework provides a standardized approach to the interpretation and delineation of dynamic ecosystem boundaries. The ELC approach classifies habitats not only by vegetation community but also considers soil moisture conditions and topography, and as such provides a basis for describing the biophysical attributes of the habitat for the Bird's-foot Violet. In Ontario, ELC terminology and methods are familiar to many land managers and conservation practitioners who have adopted this tool as the standard approach in Ontario.

Within the ELC system in Ontario, the ecosite²² boundary best captures the extent of biophysical attributes required by the species. The ecosite includes the areas occupied by Bird's-foot Violet and the surrounding areas that provide suitable habitat conditions (e.g., open, well drained) to carry out essential life processes for the species and should allow for natural processes related to population dynamics and reproduction (e.g., dispersal and pollination) to occur. The Bird's-foot Violet does not reproduce vegetatively or disperse over long distances (i.e., ripe seeds eject up to 510 cm from the parent plant, and ants may further transport the seeds an average distance of 75 cm (COSEWIC 2002; Bickerton 2013)) and therefore the occupied ELC ecosite should provide sufficient opportunity for dispersal and expansion of populations to occur. Bird's-foot Violet may also be able to colonize areas following disturbance (many forest areas where it occurs could be considered ingrown savanna) (Bickerton 2013). In linear habitats, the suitable ELC ecosite will typically be a cultural (i.e., human modified) habitat type and the 100 m parallel distance should also allow for natural processes (e.g., increases to abundance, dispersal and pollination) to occur. Ecosites containing Bird's-foot Violet have been described in Ontario as: Dry Tallgrass Savannah²³, Dry Tallgrass Woodland, Cultural Woodland, Cultural Thicket, Cultural Savannah or in openings or at the margins of Dry-Fresh Oak Deciduous Forest or coniferous plantations. ELC ecosite information is available for Turkey Point Provincial Park. Additional habitat assessments are required to delineate and map the specific ELC ecosites currently occupied by the Bird's-foot Violet.

The 50 m radial distance used in both the linear and non-linear habitat is considered a minimum critical function zone, or the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, temperature, litter moisture, humidity levels necessary for survival). At present, it is not

²² Ecosite: land with specific physical characteristics including soil, vegetation and landforms.

²³ The Ecological Land Classification (ELC) system uses the the spelling 'savannah'

clear at what distance physical and/or biological processes begin to negatively affect Bird's-foot Violet. Studies on micro-environmental gradients at habitat edges, including light, temperature, litter moisture (Matlack 1993), and of edge effects on plants in mixed hardwood forests, as evidenced by changes in plant community structure and composition (Fraver 1994), have shown that edge effects could be detected up to 50 m into habitat fragments although other studies show that the magnitude and distance of edge effects will vary depending on the structure and composition of adjacent habitat types (Harper et al. 2005). Forman and Alexander (1998) and Forman et al. (2003) found that most roadside edge effects on plants resulting from construction and repeated traffic have their greatest impact within the first 30 m to 50 m. Therefore, a 50 m distance from any Bird's-foot Violet plant was chosen as a precautionary distance to ensure that microhabitat properties were maintained as part of the identification of critical habitat. The area within the critical function zone may include both suitable and unsuitable habitat as Bird's-foot Violet may be found near a transition area / zone between suitable and unsuitable habitat. As new information on species' habitat requirements and site-specific characteristics become available, these distances may be refined.

Manicured lawns, maintained roadways or built-up features such as buildings do not possess the biophysical attributes of suitable habitat or assist in the maintenance of natural processes and are therefore not considered critical habitat.

5.1.3 Application of the Criteria to Identify Critical Habitat for Bird's-foot Violet

Critical habitat for Bird's-foot Violet is identified as the extent of suitable habitat (section 5.1.2) where the occupancy criterion (section 5.1.1) is met. In cases where the suitable habitat extends for less than 50 m around a Bird's-foot Violet, a critical function zone capturing an area within a radial distance of 50 m is also included as critical habitat.

In Ontario, as noted above, suitable habitat for Bird's-foot Violet is most appropriately identified as the ELC ecosite. At the present time, the ecosite descriptions and boundaries are not available to support the identification of critical habitat for all populations in Ontario. In the interim, where ELC ecosite boundaries are not available, ELC community series level is identified as the area within which critical habitat is found. In Ontario, critical habitat is located within these boundaries where the biophysical attributes described in section 5.1.2 are found and where the occupancy criterion is met (section 5.1.1). When ecosite boundaries are determined, critical habitat for the species will be updated.

Application of the critical habitat criteria to the best available information identifies critical habitat for the five extant populations of the Bird's-foot Violet in Canada (Figure 1; see also Table 1), totalling up to 180 ha²⁴.

²⁴ This is the maximum extent of critical habitat based on habitat boundaries that can be delineated from high resolution aerial photography (comparable to ELC, Community Series) for linear or non-linear habitats and/or a 50 m radial distance around the Bird's-foot Violet. Actual critical habitat occurs only in

Critical habitat for the Bird's-foot Violet is presented using 1 x 1 km UTM grid squares (Table 1). The UTM grid squares presented in Figure 1 are part of a standardized grid system that indicates the general geographic areas containing critical habitat, which can be used for land use planning and/or environmental assessment purposes. In addition to providing these benefits, the 1 x 1 km UTM grid respects provincial data-sharing agreements in Ontario. Critical habitat within each grid square occurs where the description of habitat occupancy (section 5.1.1) and habitat suitability (section 5.1.2) are met. More detailed information on critical habitat to support protection of the species and its habitat may be requested on a need-to-know basis by contacting Environment and Climate Change Canada – Canadian Wildlife Service at ec.planificationduretablissement-recoveryplanning.ec@canada.ca.

those areas described in section 5.1 and therefore the actual area could be less than this and would require field verification to determine the precise amount.

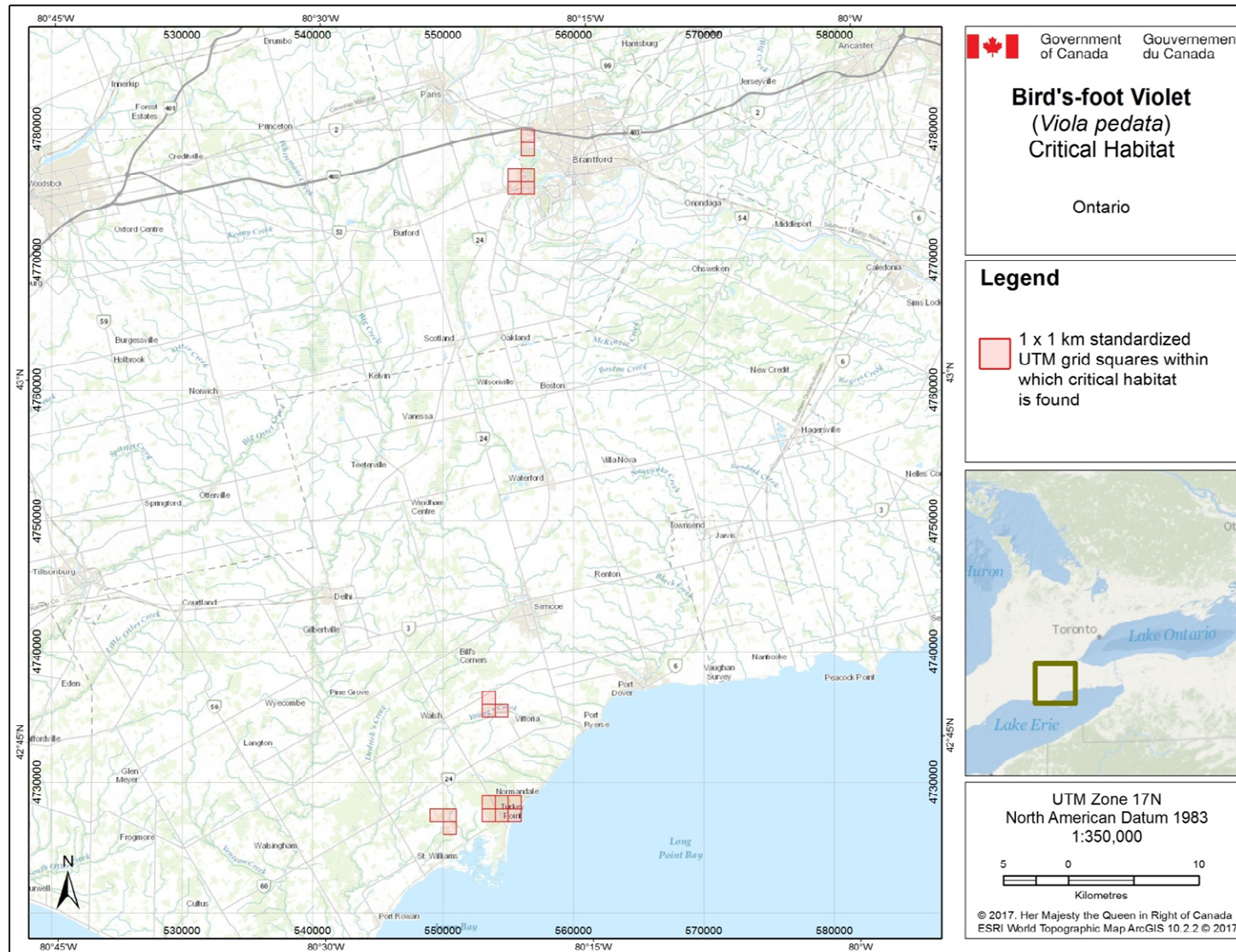


Figure 1. Grid squares that contain critical habitat for the Bird's-foot Violet in Canada. Critical habitat for the Bird's-foot Violet occurs within these 1 x 1 km standardized UTM grid squares (red shaded squares), where the description of habitat occupancy (section 5.1.1) and habitat suitability (section 5.1.2) are met.

Table 1. Grid squares that contain critical habitat for the Bird's-foot Violet in Canada. Critical habitat for the Bird's-foot Violet occurs within these 1 x 1 km standardized UTM grid squares where the description of habitat occupancy (section 5.1.1) and habitat suitability (section 5.1.2) are met.

| Population | 1 x 1 km standardized UTM grid square ID ¹ | Province/Territory | UTM Grid Square Coordinates ² | | Estimated area (Ha) that contains critical habitat ³ | Land Tenure ⁴ |
|--|---|--------------------|--|----------|---|--------------------------|
| | | | Easting | Northing | | |
| Forestville | 17TNH4297 | Ontario | 549000 | 4727000 | 34 | Non-Federal Land |
| | 17TNH5206 | | 550000 | 4726000 | | |
| | 17TNH5207 | | 550000 | 4727000 | | |
| Turkey Point Provincial Park/St. Williams Conservation Reserve | 17TNH5237 | Ontario | 553000 | 4727000 | 116 | Non-Federal Land |
| | 17TNH5238 | | 553000 | 4728000 | | |
| | 17TNH5247 | | 554000 | 4727000 | | |
| | 17TNH5248 | | 554000 | 4728000 | | |
| | 17TNH5257 | | 555000 | 4727000 | | |
| Vittoria | 17TNH5335 | Ontario | 553000 | 4735000 | 6 | Non-Federal Land |
| | 17TNH5336 | | 553000 | 4736000 | | |
| | 17TNH5345 | | 554000 | 4735000 | | |
| Near Brantford | 17TNH5755 | Ontario | 555000 | 4775000 | 24 | Non-Federal Land |
| | 17TNH5756 | | 555000 | 4776000 | | |
| | 17TNH5765 | | 556000 | 4775000 | | |
| | 17TNH5766 | | 556000 | 4776000 | | |
| Golf Course Savanna, NW part of Brantford | 17TNH5768 | Ontario | 556000 | 4778000 | 2 | Non-Federal Land |
| | 17TNH5769 | | 556000 | 4779000 | | |

¹ Based on the standard UTM Military Grid Reference System (see <http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/maps/9789>), where the first 2 digits and letter refer to the UTM Zone, the following 2 letters indicate the 100 x 100 km standardized UTM grid followed by 2 digits to represent the 10 x 10 km standardized UTM grid. The last 2 digits represent the 1 x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology produced from the Breeding Bird Atlases of Canada (See <http://www.bsc-eoc.org/> for more information on breeding bird atlases).

² The listed coordinates are a cartographic representation of where critical habitat can be found, presented as the southwest corner of the 1 x 1 km standardized UTM grid square containing all or a portion of the critical habitat unit. The coordinates may not fall within critical habitat and are provided as a general location only.

³ The area presented is that of the unit(s) containing critical habitat (rounded up to the nearest 1 ha); therefore, the actual area of critical habitat may be significantly less. Refer to Section 5 for a description of how critical habitat within these areas is defined.

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

5.2 Activities Likely to Result in the Destruction of Critical Habitat

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

Activities described in Table 2 are examples of those likely to cause destruction of critical habitat for the species; however, destructive activities are not necessarily limited to those listed.

Recognizing that Bird's-foot Violet is a colonizing species that is able to establish following disturbance, activities that result in a temporary removal of critical habitat (e.g., removal of leaf litter and woody encroachment) have the potential to contribute to the future supply of critical habitat, given proper management. Some disturbance to Bird's-foot Violet habitat may be beneficial to the species, opening up the canopy cover and suitable bare ground within a given site. In addition, some activities may have a threshold level at which they become harmful even to large populations rather than beneficial.

Table 2. Activities likely to destroy the critical habitat of the Bird's-foot Violet.

| Description of Activity | Descriptions of Effect in Relation to Function Loss | Details of Effect |
|---|---|--|
| <p>Insufficient management of suitable habitat outside the growing season that leads to increase cover (e.g., fire suppression)</p> | <p>Succession can lead to the habitat becoming increasingly unsuitable (e.g., availability of light, competition for resources) for the Bird's-foot Violet.</p> <p>Insufficient management of suitable habitat may result in a greater than 60% canopy cover and/or a loss of bare ground conditions (e.g., encroaching plants). This in turn prevents flowering, growth and germination of Bird's-foot Violet.</p> | <p>As Bird's-foot Violet requires relatively open areas of suitable habitat (e.g., bare soil or soil covered with a thin organic layer or moss cover), plants are unable to reproduce, or accomplish successful seed germination and seedling establishment.</p> <p>When this activity occurs within or adjacent to critical habitat outside the growing season (approximately November – April), it can result in habitat degradation or loss of critical habitat due to unsuitable habitat conditions; which in turn can ultimately lead to a complete decline and loss of the population.</p> |
| <p>Inappropriate management of suitable habitat during the growing season (e.g., prescribed burns, mowing, trampling)</p> | <p>Maintenance activities which remove woody or competing vegetation and leaf litter (e.g., prescribed burns, thinning of vegetation) during the species growing season could impact the species reproductive capabilities by impacting the habitat during seedling establishment and seed germination.</p> | <p>As Bird's-foot Violet is limited by its inability to reproduce vegetatively, plants require undisturbed (e.g., no prescribed burns, no mowing) habitat during the period of seed establishment and seedling germination.</p> <p>When this activity occurs within critical habitat during the growing season (approximately May - October) it can result in habitat destruction for seedling establishment and seed germination.</p> |

| Description of Activity | Descriptions of Effect in Relation to Function Loss | Details of Effect |
|--|---|--|
| Development and conversion of lands (e.g., agriculture expansion, residential or commercial development, complete removal of canopy). | Development and conversion of suitable habitat (e.g., oak savanna) results in the direct loss of critical habitat upon which the species relies for basic survival, successful seed germination and seedling establishment. | When this activity occurs within critical habitat at any time of year, the effects will be direct. This activity directly alters the physical and biological properties of the landscape and will result in habitat destruction. There are no possible thresholds for this activity. If this activity were to occur outside of critical habitat it may have an indirect impact on microhabitat characteristics (such as hydrology). |
| Activities that result in the disturbance and/or compaction of the soil substrate (e.g., sand extraction, trampling, heavy equipment). | Any alteration to the natural dynamic processes of erosion (e.g., sand extraction from the embankment of a sandy oak knoll ²⁵), directly compromising the stabilizing properties would result in the direct loss of critical habitat. Soil compaction could render the habitat unsuitable for Bird's-foot Violet seed germination and seedling establishment. | These activities could occur as a result of a single activity (of significant magnitude), or through repeated smaller disturbances within or directly adjacent to critical habitat. This activity will result in habitat destruction regardless of what time of year it is conducted. |
| Activities that introduce invasive species, (e.g. through introduction of non-native plant seeds, plants, foreign soil or gravel, composting or dumping of garden waste, livestock grazing). | Introducing invasive species can result in competition with the species, and/or physical and chemical changes to habitat such that it is no longer suitable for the species. | Introduction of an invasive species in or adjacent to critical habitat can lead to gradual destruction of critical habitat over time. Thresholds are not applicable to this activity, as introduction of even a single individual could lead to further spread of the species. |
| Application of herbicides, or fungicides. | Herbicides and fungicides may potentially destroy or deplete the mycorrhizal fungi and associated herbaceous species upon which the species likely depends for carrying out essential aspects of its life cycle. | When this activity occurs within or immediately adjacent to critical habitat at any time of year, its effects may be direct or cumulative. The critical habitat will likely be destroyed if soil fungi likely required by Bird's-foot Violet is significantly depleted or destroyed. The information available at this time is insufficient to develop a threshold for this activity. |

²⁵ Knoll: a small hill (the Vittoria population is situated at the top of a sandy oak knoll (Bickerton 2013))

6. Measuring Progress

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

- Abundance and area of occupancy of the Bird's-foot Violet at extant populations in Canada have been maintained, or increased where necessary and biologically and technically feasible.

7. Statement on Action Plans

One or more action plans will be completed and posted on the Species at Risk Public Registry for the Bird's-foot Violet by December 31, 2026.

8. 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](#)²⁶. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s²⁷ (FSDS) goals and targets.

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

The recovery strategy will clearly benefit the environment by promoting the recovery of the Bird's-foot Violet. The Virginia Goat's-rue shares the same habitat and co-occurs with Bird's-foot Violet at sites in St. Williams Conservation Reserve and Turkey Point Provincial Park (Kavanagh et al. 1990; R. Gould pers. comm. 2012). Spotted

²⁶ www.canada.ca/en/environmental-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html

²⁷ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1

Wintergreen (*Chimaphila maculata*) and Eastern Flowering Dogwood (*Cornus florida*) also occur in similar habitats within these natural areas, and may additionally benefit from recovery actions. Thirteen other plant species that are considered provincially significant are associated with Bird's-foot Violet (Kavanagh et al. 1990) and may benefit from habitat management of oak savanna.

Populations of fauna at risk (e.g., Acadian Flycatcher (*Empidonax virescens*), Eastern Whip-poor-will (*Antrostomus vociferus*), Eastern Hog-nosed Snake (*Heterodon platyrhinos*), and Eastern Foxsnake (*Pantherophis gloydi*)) are also known from areas of St. Williams Conservation Reserve (White 2012), and are found occasionally in similar sandy, dry habitats within southwestern Ontario. The Bird's-foot Violet is also considered to be the larval host for the Regal Fritillary (*Speyeria idalia*) butterfly (Thompson 2006).

The potential for this federal recovery strategy to have adverse effects on other species was considered. In order to recover Bird's-foot Violet in Canada, management activities such as selective thinning of the canopy or prescribed burns may be undertaken at certain sites. Although these have the potential to harm some species in the short term, the ecological risks of these management activities will be assessed before they are completed, in order to avoid potential negative effects. Recovery actions for species that share a similar habitat and range (e.g. Virginia Goat's-rue, Spotted Wintergreen) include similar recovery actions including prescribed burns and canopy thinning (Ursic et al. 2010, Mohr 2013).

The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects that cannot be avoided or mitigated.

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Appendix A: Subnational Conservation Ranks of Bird's-Foot Violet (*Viola pedata*) in Canada and the United States

| Bird's-foot Violet (<i>Viola pedata</i>) | | | | |
|--|----------------------------|--------------------------------|-----------------------------------|---|
| Global (G) Rank | National (N) Rank (Canada) | Sub-national (S) Rank (Canada) | National (N) Rank (United States) | Sub-national (S) Rank (United States) |
| G5 | N1 | Ontario (S1) | N5 | Alabama (SNR), Arkansas (SNR), Connecticut (SNR), Delaware (S1), District of Columbia (SNR), Georgia (SNR), Illinois (SNR), Indiana (SNR), Iowa (S4), Kansas (SNR), Kentucky (S5?), Louisiana (SNR), Maine (SNR), Maryland (SNR), Massachusetts (SNR), Michigan (SNR), Minnesota (SNR), Mississippi (SNR), Missouri (SNR), Nebraska (S1), New Hampshire (S2), New Jersey (S4), New York (S3), North Carolina (S4), Ohio (S3), Oklahoma (SNR), Pennsylvania (SNR), Rhode Island (S3), South Carolina (SNR), Tennessee (SNR), Texas (SNR), Virginia (S5), West Virginia (S4), Wisconsin (SNR) |

(NatureServe 2014)

Rank Definitions (NatureServe 2014)

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

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

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

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

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

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

**Part 2 – *Recovery Strategy for the Bird’s-foot Violet*
(*Viola pedata*) in Ontario, (2013) prepared for the Ontario
Ministry of Natural Resources**



Bird's-foot Violet
(Viola pedata) in Ontario

Ontario Recovery
Strategy Series

Recovery strategy prepared under the Endangered Species Act, 2007

2013

Natural. Valued. Protected.

About the Ontario Recovery Strategy Series

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

What is recovery?

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

What is a recovery strategy?

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

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

What's next?

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

For more information

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

RECOMMENDED CITATION

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AUTHORS

Holly J. Bickerton – Consulting Ecologist, Ottawa, Ontario.

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DECLARATION

The recovery strategy for the Bird's-foot Violet was developed in accordance with the requirements of the *Endangered Species Act, 2007* (ESA). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

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

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

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

RESPONSIBLE JURISDICTIONS

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

EXECUTIVE SUMMARY

Bird's-foot Violet (*Viola pedata*) is a distinctive and showy perennial violet. It ranges across much of the eastern United States and has been reported from 14 populations distributed across a broad area in southwestern Ontario. It is considered globally secure (G5) but critically imperilled (N1) in Canada. Bird's-foot Violet is designated as endangered under Ontario's *Endangered Species Act, 2007*.

Of the documented 14 populations, there are currently only five populations considered extant in Canada, occupying a much-reduced range in Brant and Norfolk counties. Only one of these five populations is found on public land managed for conservation. Although recent information is lacking, this large population is believed to be stable or increasing due to ongoing habitat management and protection. The remaining four populations are found entirely on private land, and face many threats. At three of these four sites, fewer than 10 plants remained when they were last observed.

Bird's-foot Violet favours dry, open, sandy sites throughout its range. At its five remaining sites in Ontario, it grows mainly in oak savanna (or ingrown savanna) on well-drained, sandy soils. The species has a strong preference for sites with an open canopy, bare soil and a thin organic layer or moss cover. Originally, such open habitat would have been maintained by fire. In the settled southern Ontario landscape, the long-term maintenance of oak savanna requires regular management, such as brush cutting or prescribed burning.

The predominant threat to this species in Ontario is fire suppression which results in shaded and unsuitable conditions. This threatens plants mainly at the sites on private lands. Other threats include habitat loss through conversion to homes and gardens, trampling and recreational pressure, erosion, and competition from invasive species. The small size and limited spatial extent of most populations further compounds the risks that these threats pose to Bird's-foot Violet.

The recovery goal for Bird's-foot Violet is to maintain or increase the current abundance, area of occupancy and range extent within Ontario, by managing habitat and restoring or re-introducing the species to suitable habitat within its known range. Protection and recovery objectives are to:

1. protect extant populations by working collaboratively with landowners;
2. manage extant populations to maintain suitable habitat conditions;
3. monitor populations and habitats regularly, particularly in response to management actions; and
4. if necessary to meet the recovery goal, re-establish and/or introduce populations in suitable habitat within the species' former range.

It is recommended that the area prescribed as habitat in a regulation for Bird's-foot Violet include the extent of the Ecological Land Classification (ELC) Ecosite polygon(s) (Lee et al. 1998) within which the species is found. If plants are close to the edge of a polygon, a minimum distance of 50 metres from the outer limit of the population is

recommended for regulation. The areas surrounding cultivated Bird's-foot Violet plants and those originating from outside Canada should be excluded from regulation. Habitat mapping of all populations and sub-populations of this species would inform the regulation process.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Bird's-foot Violet

SCIENTIFIC NAME: *Viola pedata*

SARO List Classification: Endangered

SARO List History: Endangered (2005), Endangered – Not Regulated (2004)

COSEWIC Assessment History: Endangered (2002), Threatened (1990)

SARA Schedule 1: Endangered (January 12, 2005)

CONSERVATION STATUS RANKINGS:

GRANK: G5

NRANK: N1

SRANK: S1

The glossary provides definitions for technical terms, including the abbreviations above.

1.2 Species Description and Biology

Species Description

Bird's-foot Violet (*Viola pedata*) is a herbaceous perennial in the violet family (Violaceae). Its common name derives from its distinctive, deeply divided leaves that resemble the splayed toes of a bird. Each leaf is three-parted and each division is further divided into three to five segments. In spring and autumn, lilac-purple flowers appear individually on leafless stalks that arise directly from the base of the plant (with the plants therefore appearing “stemless”). The five petals of the flower may be all the same colour, or the upper two may be darker in colour than the lower three petals (COSEWIC 2002). An entirely white form (*V. pedata* f. *alba*) also exists and has been reported from Ontario populations (Kavanagh et al. 1990). Flowers are broader (up to three centimetres across) and flatter than in many other native violets (Voss and Reznicek 2012). The unusually divided leaf and broad, erect flower with various colour forms make this a relatively showy violet, which can be cultivated in rock gardens. Following pollination, small, copper-coloured seeds are contained in smooth green capsules (COSEWIC 2002).

Bird's-foot Violet is quite distinctive in flower and in its vegetative form and is not likely to be confused with other species. In the past, it has been confused with Prairie Violet (*V. pedatifida*), which is known in Ontario only from a single population near Brantford, and the more widespread Wood Violet (*V. palmata*) (Kavanagh et al. 1990). Detailed botanical descriptions can be found in Gleason and Cronquist (1991) and Voss and Reznicek (2012). Technical illustrations are shown in Holmgren (1998).

Species Biology

In Ontario, Bird's-foot Violet flowers in mid-May to mid-June, and again in late September to mid-October. Plants may flower profusely in ideal habitat conditions, with up to 80 or more flowers on large individuals (Kavanagh et al. 1990). Unlike most other violets native to Ontario, it does not produce cleistogamous¹ flowers and cannot self-fertilize (Kavanagh et al. 1990).

Flowers are pollinated by long-tongued insects, primarily bumblebees (*Bombus* spp.) and certain butterflies (Kavanagh et al. 1990). Ripe seeds are forcefully ejected from mature capsules; in greenhouse conditions, these spread an average of 140 cm (and up to 510 cm) from the parent plant (Beattie and Lyons 1975). Ants are attracted to a lipid-rich structure on the seed, and may further transport *Viola* seeds an average distance of 75 cm to their nests (Culver and Beattie 1978). In addition to assisting with seed dispersal, this is thought to reduce seed predation and increase germination and seedling establishment. *Viola* seeds are eaten by birds, small mammals, caterpillar larvae, and occasionally ants (Beattie and Lyons 1975, Culver and Beattie 1978).

Bird's-foot Violet does not produce stolons or rhizomes, and therefore cannot reproduce vegetatively like many other violets (COSEWIC 2002). It has been suggested that plants require at least five years before reaching reproductive maturity (Molano-Flores 1999), although demographic studies could not be found. This showy species can be grown from seed (Cullina 2000), and a variety of cultivars is available commercially in Ontario. No information could be found about the longevity of seeds in soil.

Many members of the genus *Viola* in the United Kingdom have been found to have obligately symbiotic relationships with mycorrhizal fungi, which assist plants with the uptake of soil nutrients (Harley and Harley 1987). It is possible but not known whether North American species have similar associations.

Deer, cattle, rabbits and the caterpillars of several species of Fritillary (*Speyeria* spp.) have been reported as herbivores on the foliage of Bird's-foot Violet (Molano-Flores 1999) although this has not been documented as a threat at Ontario sites. In greenhouse conditions, seedlings and plants may be affected by other diseases (e.g., anthracnose, root rot) and pests (e.g., gall midges) (Molano-Flores 1999).

1.3 Distribution, Abundance and Population Trends

Distribution

Bird's-foot Violet occurs only in eastern North America from southern Ontario, New York and Minnesota, south to Georgia and Texas. In Canada, it has been documented only from 14 populations in southwestern Ontario, of which only five are believed to be

¹ Cleistogamous flowers are fertilized and set seed without opening (Voss and Reznicek 2012). Such flowers are common in the genus *Viola*; they are produced later in the season and are on shorter stalks, often close to the ground.

extant (Figure 1; Table 1; COSEWIC 2002; G. Buck, pers. comm. 2012; R. Gould, pers. comm. 2012). Nine extirpated populations have been documented.

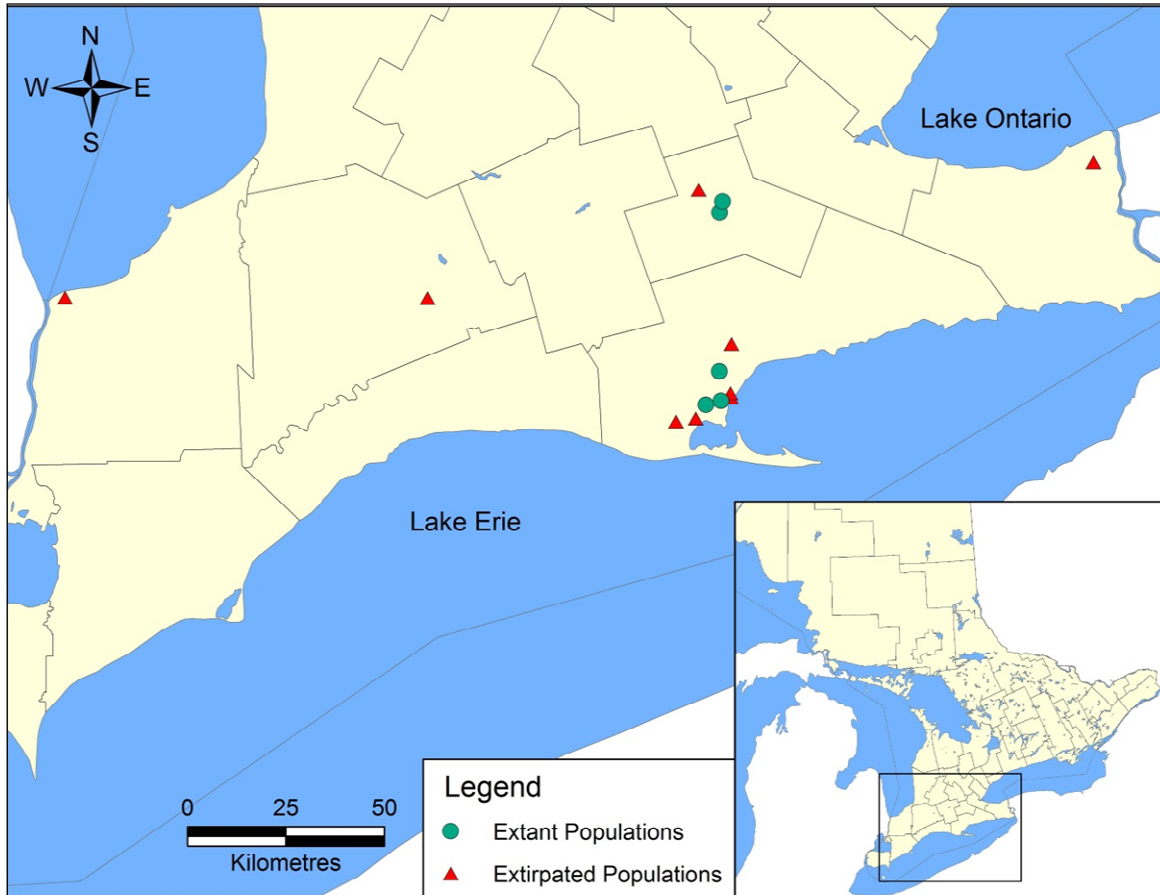


Figure 1. Extant and extirpated populations of Bird's-foot Violet in Ontario.

Table 1. Extant populations of Bird's-foot Violet in Ontario.

| Location | Last observed | Population | Threats | Owner or Manager |
|--|---------------|--|--|------------------|
| Near Brantford | 2001 | ~100 plants (4 sub-populations) | Housing development; fire suppression | Private |
| Golf Course Savanna, NW part of Brantford | 1996 | 1996: 10 flowering plants 2006: Searched by R. Gould and D. Kirk, none observed. | Fire suppression | Private |
| Forestville | 2001 | 1 plant | Fire suppression, small population size | Private |
| Turkey Point Provincial Park (including Turkey Point Tract of St. Williams Conservation Reserve) | ~2011 | TPPP: 2001: 6500 plants (in 8 sub-populations) ~2011: population estimated at 6500 or more | Trampling and recreational pressure | Ontario Parks |
| | ~2011 | St. Williams Conservation Reserve (Turkey Point Tract): 2001: 183 plants ~2011: 500 plants (estimate) | Invasive species, trampling, recreational pressure | OMNR |
| Vittoria | 2005-2007 | 2001: 9 plants 2005-2007: 7-9 plants | Erosion, fire suppression, small population size | Private |

Sources: COSEWIC (2002), R. Gould, pers. comm. 2012, NHIC (2012), A. Heagy, pers. comm. 2013.

Since the last COSEWIC status report (2002), one additional site has been discovered on property recently purchased by the Nature Conservancy of Canada. Bird's-foot Violet was discovered following a prescribed burn in a location where it had not previously been reported (G. Buck, pers. comm. 2012). The property on which this new population is found has now been regulated as part of Turkey Point Provincial Park and is likely to be considered a sub-population of the existing Element Occurrence at Turkey Point Provincial Park².

² To be considered as new Element Occurrences, plant populations must typically be separated from previously identified EOs by at least one kilometre (NatureServe 2012). In this document, a population is considered synonymous with an EO. Several sub-populations may be contained within one EO or population.

However, the total extent of suitable oak savanna habitat in Ontario is extremely limited and has been well surveyed, and this species is relatively distinctive. Together, these factors make it unlikely that new populations will be discovered.

Abundance and Population Trends

At the time of the 2002 COSEWIC status report, the total population of Bird's-foot Violet in Canada (i.e., in Ontario) was estimated at 6,800 plants, in five locations. This represented a significant population decline from 1990 estimate of 13,600 plants at three locations (Kavanagh et al. 1990). Although a more recent population estimate is not available, current information on each population is summarized below.

One Element Occurrence (EO) on public conservation lands in Ontario is considered stable. This EO consists of two main sub-populations within St. Williams Conservation Reserve (Turkey Point Tract) and at Turkey Point Provincial Park. Both of these sub-populations are probably increasing in size since the previous status report was completed in 2002 (R. Gould, pers. comm. 2012). Following prescribed burning in 2005 and again in 2010, the sub-population at the Turkey Point Tract within the St. Williams Conservation Reserve has increased in density and extent, with an estimated 500 plants observed in the last few years (R. Gould, pers. comm. 2012).

Similarly, continued fire re-introduction and use in the nearby sub-population at Turkey Point Provincial Park has resulted in an increase in the area occupied by Bird's-foot Violet, as well as its density and vigour. Although partial counts are made, a total census of this sub-population has not been made since 2001. The population is believed to equal or exceed the 2001 estimate of 6,500 plants (R. Gould, pers. comm. 2012).

The remaining four EOs, all on private property, are much more precarious. One formerly large Brantford population (3,300 plants in six sub-populations in 1987) had declined severely to about 100 plants in only four sub-populations by 2000. Two sub-populations were entirely lost to housing development. No access has been granted to these sites in recent years, so no further abundance information is available.

Another Brantford EO at a golf course has not reappeared despite several prescribed burns in suitable habitat, and is probably extirpated (G. Buck, pers. comm. 2012). Apart from burns at the golf course site, no management is known to have occurred at any of the Brantford sites. Oak savanna habitat at the golf course site is considered highly suitable for continued restoration and possible re-introduction (G. Buck, pers. comm. 2012).

The Forestville site has not been visited since 2001 (R. Gould, pers. comm. 2012, M. Gartshore, pers. comm. 2012), and it may be extirpated. Even in 2001, the oak savanna habitat at the site was becoming overgrown, and no management is known to have occurred since that time. However, based on experience at other sites, it is possible that the population could be recovered through site management such as prescribed burning, or perhaps even by using mechanical thinning techniques (R.

Gould, pers. comm. 2012). The resulting open habitat conditions would promote germination of seeds, assuming that they remain viable in the soil.

The population near Vittoria was visited between 2005 and 2007 and numbered around seven to nine plants (R. Gould, pers. comm. 2012). No management of this site has been undertaken, although suitable habitat is abundant and there is significant potential for restoration of the oak savanna, benefitting a number of other rare and at-risk species.

Nine of the fourteen documented populations are considered extirpated by the Ontario Natural Heritage Information Centre. These are: Sarnia (last observed in 1909), Paris (1900), London (1890), Niagara-on-the-Lake (1906), Simcoe (1905), St. Williams³ (1936), Normandale (1928), One mile north of Normandale (1960), and Backus Woods (1963) (NHIC 2012).

The majority of these old records have only vague locality data. One exception is the Backus Woods population, based on a 1963 collection. However, despite extensive searches in this area, including inventories by Steve Varga in 1985 and Bill Draper in 2011–2012, this population has not been rediscovered (COSEWIC 2002, W. Draper, pers. comm. 2012).

1.4 Habitat Needs

Throughout its range, Bird's-foot Violet favours dry, open, sandy sites, including savanna, prairies and slopes, and usually grows in association with oaks and/or pines (Kavanagh et al. 1990; Voss and Reznicek 2012). Habitat characteristics at the remaining Ontario populations have been well documented, although in some cases this information is now dated. Species inventories have been undertaken at most sites (Kavanagh et al. 1990), and a Masters' thesis has been completed to determine optimal microhabitat requirements at Ontario sites (Thompson 2006).

Bird's-foot Violet requires open conditions and benefits from fire. Plants at burned sites have shown to produce more flowers (Thompson 2006) and greater numbers of seeds (O'Dell 1996, cited in Thompson 2006) than plants at unburned sites. Compared with unburned sites, the effects of a burn on flower and fruit production have been observed even six years following a burn (Thompson 2006). Positive responses are likely due to the resultant removal of leaf litter, increase in bare soil cover and removal of tree, sub-canopy and shrub layers.

In Ontario, Bird's-foot Violet prefers oak savanna habitat, which may be dominated by Black Oak (*Quercus velutina*), White Oak (*Quercus alba*) and/or Red Oak (*Quercus rubra*). The sparse shrub layer, where present, typically contains species including Chokecherry (*Prunus virginiana*), Frost Grape (*Vitis riparia*), Staghorn Sumac (*Rhus*

³ This 1936 occurrence lies several kilometres to the west of the extant sub-population in the Turkey Point Tract of the St. Williams Conservation Reserve.

typhina), Wild Red Raspberry (*Rubus idaeus* ssp. *strigosus*), Gray Dogwood (*Cornus racemosa*) and Virginia Creeper (*Parthenocissus inserta*). Species often present in the understory typically include graminoids such as Little Bluestem (*Schizachyrium scoparium*), Kentucky Bluegrass (*Poa pratensis*), Hay Sedge (*Carex foenea*), Canada Bluegrass (*Poa compressa*) and Pennsylvania Sedge (*Carex pennsylvanica*). Common herbaceous plants include Hawkweeds (*Hieracium* spp.), Sheep Sorrel (*Rumex acetosella*), Field Pussytoes (*Antennaria neglecta*), Arrow-leaved Aster (*Symphotrichum urophyllum*), Canada Goldenrod (*Solidago canadensis*), Long-branched Frostweed (*Helianthemum canadense*), Plains Frostweed (*Helianthemum bicknellii*), Wild Strawberry (*Fragaria virginiana*), Wild Carrot (*Daucus carota*), Gray Goldenrod (*Solidago nemoralis*) and Bracken (*Pteridium aquilinum*) (Kavanagh et al. 1990). Virginia Goat's-rue (*Tephrosia virginiana*), also at-risk in Ontario, occurs with Bird's-foot Violet at several sites (Kavanagh et al. 1990; R. Gould, pers. comm. 2012).

Of associated species, Thompson (2006) found that the presence of Bird's-foot Violet was most strongly associated with Pilose Evening Primrose (*Oenothera pilosella*), Sheep Sorrel (*Rumex acetosella*) and Acuminate Panic Grass (*Panicum acuminatum*, now *Dichantherium acuminatum*).

Detailed habitat and population information was collected at 180 microplots at three of the five Ontario populations (Thompson 2006). Biotic and abiotic factors including percentage of canopy opening, total vegetation cover and species composition, soil pH and nutrient profile, and soil cover (bare soil, litter, moss, etc.) were examined to determine which of these was most associated with the presence, vigour and reproductive capacity of the species. The study determined that plots associated with Bird's-foot Violet are most strongly associated with an open canopy (greater than 15% canopy openness, as measured by gap light analysis of canopy photos using specific software), bare soil or soil covered with a thin organic layer, and moss cover (for further information and methods, see Thompson 2006). This association is sufficiently strong that Thompson (2006) recommends habitat management (e.g., burning or mechanical thinning) if light levels reach less than 10% canopy openness.

The soils associated with Bird's-foot Violet consist of well-drained sandy loams and silty sands, which are dry through the late spring and summer (Kavanagh et al. 1990). No significant difference in soil pH could be found between similar microplots with and without Bird's-foot Violet (Thompson 2006). This species generally occurs in nutrient-poor soils but no clear patterns emerged in relation to the presence of soil nutrients at the microhabitat level (Thompson 2006).

In an analysis of suitable habitat, Thompson (2006) found that much of the habitat in and near Turkey Point Provincial Park would probably support Bird's-foot Violet, but it may be prevented from colonizing other sites due to its limited dispersal distances. The detailed habitat requirements in this study could be used to evaluate potential sites for restoration or population augmentation.

At Turkey Point Provincial Park, the large Bird's-foot Violet sub-population occurs within the following ELC vegetation communities (see Lee et al. 1998 and Lee 2008):

- Dry Red Oak Deciduous Savanna (SVDM3-1)
- Dry-Fresh Black Oak Deciduous Savanna (SVDM3-23)
- Dry-Fresh Oak-Maple Deciduous Savanna (SVDM3-26) (Chambers 2010).

However, the largest single sub-population at Turkey Point PP occurs within a linear hydro corridor that is too narrow to be mapped as an ELC polygon. Although anthropogenic in origin, this area consists of low herbaceous growth on drought-prone soils, and several prairie indicator species are present along the corridor length (R. Gould, pers. comm. 2012). Small patches of Bird's-foot Violet also occur in areas considered as Parkland (CGL-2) and in openings or at the margins of coniferous plantations, many of which are in the process of being restored to native savanna communities.

At the Turkey Point Tract of the St. Williams Conservation Reserve, Bird's-foot Violet is found along the margins of narrow bicycle trails and in oak openings within a Dry-Fresh Black Oak Deciduous Forest (FOD1-3) (Draper et al. 2002). Currently classified as forest, this area is considered by the authors to be "ingrown oak savanna." Although this community is not recognized within the ELC for southern Ontario (Lee et al. 1998), the authors broadly define it as a plant community on drought-prone soils with one or more conservative indicator plants associated with tallgrass prairie and savanna in Ontario. Areas of ingrown savanna were identified in this report in order to suggest sites within the reserve that were likely to have been oak savanna at the time of European settlement and which may be restored to this state.

No ELC mapping is known from the privately-owned sites where Bird's-foot Violet is found. At three of these sites where no management is known to have occurred, it is possible that occupied habitat would now be considered deciduous forest (or "ingrown savanna"), and that several of the associated understory species listed above are no longer present. Bird's-foot Violet may persist for some time in small isolated patches of degraded habitat, although experience has demonstrated that populations may rebound quickly when appropriate management is undertaken (R. Gould, pers. comm. 2012).

1.5 Limiting Factors

The main limiting factor for Bird's-foot Violet is its highly specific habitat requirements, combined with the lack of available suitable habitat in Ontario. The fact that suitable habitat must be actively maintained to sustain this species further limits its persistence and spread.

The reproduction of Bird's-foot Violet is limited by its inability to self-pollinate, reproduce vegetatively and disperse widely. However, the species is quite common in areas of

suitable habitat in the United States (where it is ranked N5, or secure), suggesting that these biological characteristics do not inherently limit the population across its range.

At least three populations are extremely small in number (10 or fewer plants), and occur over very limited areas, increasing the risk of their extirpation by both the anthropogenic threats below and by natural events. Given the highly restricted seed dispersal distances, these small populations are geographically isolated and are unlikely to be naturally re-established. Inbreeding depression may also limit small populations, although this has not been demonstrated.

1.6 Threats to Survival and Recovery

Fire Suppression

In the past, natural and human-caused fires shaped and maintained oak savanna habitat in southern Ontario (Rodger 1998). Because Bird's-foot Violet's oak savanna habitat now requires regular management (e.g., through prescribed burning or thinning) to maintain the open conditions favoured for growth and reproduction, an absence of management will eventually result in the habitat becoming unsuitable. The remaining types of natural disturbance that create open conditions (e.g., storms, severe drought, insect outbreaks) are insufficient to maintain the conditions required at specific sites. Fire suppression across southern Ontario, combined with an absence of habitat management, probably represents the single largest threat facing the species in Ontario. All four privately owned occurrences are at significant risk of loss as habitat becomes increasingly unsuitable for this species.

Habitat Loss

Historically, the conversion of oak savanna habitat to agricultural land has been the single largest cause of the decline in abundance and extent of Bird's-foot Violet in Ontario (Thompson 2006). Although it remains a serious threat, it is probably now of secondary importance to fire suppression. Within the last two decades, housing and associated landscaping have further eliminated a large percentage of plants and their habitat in Brantford (COSEWIC 2002; Kavanagh et al. 1990). Four of the five known extant Ontario occurrences are privately owned (wholly or in part), and two of these four (Brantford Golf Course Savanna and Forestville) may already be extirpated.

Trampling and Recreational Pressure

Kavanagh et al. (1990) noted that this species appears sensitive to trampling, although Bird's-foot Violet is tolerant to some disturbance and can grow well alongside trails where more light is available. Individual Bird's-foot Violet plants sometimes appear within recreation areas (e.g., playgrounds, lawns, picnic areas) at Turkey Point Provincial Park, and areas where Bird's-foot Violet is present are sometimes mown (M. Gartshore, pers. comm. 2012). Trampling and maintenance of these sites (e.g., mowing) may threaten small numbers of individuals (COSEWIC 2002), although this threat is probably minor, considering the large populations now present in the area (R. Gould, pers. comm. 2012).

Utility Corridor Management

Most plants in the large Turkey Point Provincial Park population occur along a hydro corridor (R. Gould, pers. comm. 2012). Regular vegetation clearance has likely helped these plants to persist and thrive. However, it is possible that there are negative impacts associated with maintenance of the hydro corridor. Careful assessment and monitoring of management practices would clarify the severity of this threat.

Erosion

The Vittoria site lies at the top of a sandy oak knoll, adjacent to a steep road cut. Although progressing slowly, erosion is considered a threat to this very small population and is exacerbated by a local practice of digging sand out of the side of the bottom of the embankment, undermining the savanna at the top (R. Gould, pers. comm. 2012).

Invasive and Aggressive Species

The dry sand plain habitat favoured by Bird's-foot Violet excludes many of the common invasive plant species in Ontario. However, in St. Williams' Conservation Reserve, Garlic Mustard has the potential to affect Bird's-foot Violet populations (White 2012), presumably through competition for resources and habitat alteration. Spotted Knapweed (*Centaurea maculosa*) is also present near the St. Williams and Turkey Point Provincial Park sites. Other species native to Ontario, including Poison Ivy (*Toxicodendron radicans*), Black Cherry (*Prunus serotina*), and Staghorn Sumac (*Rhus typhina*) can become dominant in areas following fire and may shade out Bird's-foot Violet (R. Gould, pers. comm. 2012, K. Breault, pers. comm. 2012).

1.7 Knowledge Gaps

Population and Habitat Status

The single most important knowledge gap for Bird's-foot Violet in Ontario is a lack of information on the population status and abundance at the privately owned sites (which include several populations, some with multiple landowners). In recent years, access has not been granted to visit several privately owned sub-populations. An assessment of the current severity of threats (e.g., canopy shading and erosion, as well as the presence of invasive species and an assessment of their risk to populations) is also urgently needed. The minimum viable population of Bird's-foot Violet is not known, but would be helpful information given the critically low population abundance at some Ontario sites.

Managed sites on public land would also benefit from increased, regular, standard monitoring and documentation of their population and extent, especially in response to management actions.

Seed Ecology

Nothing is known of seed bank characteristics such as longevity. Because reproduction in Bird's-foot Violet is entirely dependent on seeds, this information could benefit

restoration efforts at historical and overgrown sites and inform the development of a habitat regulation.

Management and Restoration Techniques

Bird's-foot Violet has responded positively to prescribed fire at Turkey Point Provincial Park and St. Williams Conservation Reserve (R. Gould, pers. comm. 2012). However, documentation of the response of Bird's-foot Violet to prescribed fire is lacking. More detailed study of the species' response to a variety of management methods (fire, mechanical thinning, mowing) would help to provide information to managers about optimal fire frequency, temperature and other conditions. The success of assisting seed dispersal (i.e., spreading seeds into the immediate area to increase the likelihood of germination) is not known. There is little experience in propagating and transplanting this species in Ontario (M. Gartshore, pers. comm. 2012, G. Buck, pers. comm. 2012).

1.8 Recovery Actions Completed or Underway

Due to the completion of ecological research on this species in Ontario (Thompson 2006), many ecological parameters that could assist in restoration and re-introduction are well understood.

The Turkey Point Provincial Park population has been managed to restore oak savanna since the early 1990s. The Park Management Plan (OMNR 1989) supports oak savanna restoration and the use of prescribed burning as a management tool. A vegetation management plan has been developed for Turkey Point Provincial Park, in which a primary objective is to maintain representations of oak savanna and prairie, with their associated rare species (OMNR 1987). In this plan, park vegetation is described and a number of management options are given in phases. Most areas occupied by Bird's-foot Violet have now undergone multiple burns, and the species has responded positively (R. Gould, pers. comm. 2012).

Prescribed burning has also been used as a management tool at the Turkey Point Tract within the St. Williams Conservation Reserve, with burns completed in 2005 and 2010 (R. Gould, pers. comm. 2012). The St. Williams Conservation Reserve, which also includes the Nursery Tract, has recently (2008) been regulated as a provincial Conservation Reserve. The area is now under management by the Ontario Ministry of Natural Resources, in co-operation with the St. Williams Conservation Reserve Community Council (SWCRCC) non-profit organization. Management of the reserve is guided by a conservation-oriented management plan to protect, maintain and restore natural communities, including oak savanna (OMNR 2005). A detailed Life Science Inventory has been completed, in which areas of the reserve which originally supported oak savanna have been identified (Draper et al. 2002). An Operations Plan (OMNR 2009) identifies specific approaches, identifies and maps priority areas for restoration, and outlines management techniques for oak savanna and other habitats within the reserve. Finally, a detailed species-at-risk survey has been completed for the reserve

(White 2010). The SWCRCC works closely with the OMNR to implement the Operations Plan.

Since 2008, the SWCRCC has undertaken many stewardship and communication activities to protect species-at-risk habitat in the reserve including installing signage to delineate the authorized recreational trail system, closing unauthorized trails through species-at-risk habitats, undertaking species-at-risk surveys in selected priority management areas, and undertaking vegetation management activities to convert conifer plantations to oak savannah habitat to benefit species at risk. In 2011, the Council produced and distributed a printed bookmark featuring information on the Bird's-foot Violet and its conservation needs. This species is also one of more than 30 species at risk highlighted on the SWCRCC's website.

The SWRCC is currently working with ecological consultants to develop a comprehensive species at risk management plan for the entire reserve. The preliminary draft of this plan summarized the specific management needs of the various species at risk found in forested habitats in the reserve, including Bird's-foot Violet (White 2012). Planning is underway for future prescribed burns in priority oak savanna habitats at the Turkey Point Tract, including that in the vicinity of the Bird's-foot Violet population.

Habitat management of oak savanna has been undertaken at the Golf Course Savanna occurrence in Brantford. Bird's-foot Violet has been documented at this site but has not reappeared (G. Buck, pers. comm. 2012). Stewardship of other areas of oak savanna on private lands within the range of Bird's-foot Violet has been underway for several years, and considerable expertise in habitat management (e.g., prescribed burning, brush cutting, seed collection and restoration planting) exists in southwestern Ontario. A recovery plan for tallgrass communities in southern Ontario (Rodger 1998) continues to provide a planning framework for restoration and recovery activities (K. Breault, pers. comm. 2012).

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal for Bird's-foot Violet is to maintain or increase the current abundance, area of occupancy and range within Ontario by managing habitat and restoring or re-introducing the species to suitable habitat within its known range.

2.2 Protection and Recovery Objectives

Table 2. Protection and recovery objectives

| No. | Protection or Recovery Objective |
|-----|---|
| 1 | Protect extant populations by working collaboratively with landowners. |
| 2 | Manage extant populations to maintain suitable habitat conditions. |
| 3 | Monitor populations and habitats regularly, particularly in response to management actions. |
| 4 | If necessary to meet the recovery goal, re-establish and/or introduce populations in suitable habitat within the species' former range. |

2.3 Approaches to Recovery

Table 3. Approaches to recovery of the Bird's-foot Violet in Ontario

| Relative Priority | Relative Timeframe | Recovery Theme | Approach to Recovery | Threats or Knowledge Gaps Addressed |
|--|------------------------|--|--|---|
| 1.0 Protect extant populations by working collaboratively with landowners | | | | |
| Critical | Short-term and Ongoing | Communications, Protection, Management | 1.1 Identify and contact current private landowners to evaluate (or re-evaluate) interest in the protection and management of Bird's-foot Violet. Build collaborative relationships with private property owners (a long-term initiative). | <ul style="list-style-type: none"> • Habitat loss • Fire suppression |
| Critical | Long-term | Communications, Protection | 1.2 Working with landowners, investigate and undertake additional methods of long-term stewardship and protection of each site; e.g.: <ul style="list-style-type: none"> – secure Species at Risk stewardship funding and/or Conservation Land Tax Incentive Program tax incentives; – participate in local conservation stewardship programs; – protect land through securement, easements or acquisition; – develop, field-test, and distribute concise Best Management Practice documents (BMPs) for appropriate management of Bird's-foot Violet (oak savanna) habitat; and – if necessary, develop habitat mapping guidelines so that Bird's-foot Violet habitat is eligible for the CLTIP program. | <ul style="list-style-type: none"> • Habitat loss • Fire suppression • Utility corridor management • Invasive and aggressive species • Trampling and recreational pressure |
| 2.0 Manage extant populations to maintain suitable habitat conditions | | | | |
| Critical | Short-term | Management, Stewardship | 2.1 Engage with landowners or land managers to identify management needs for each population; develop (or maintain) an oak savanna habitat management plan for extant sites. | <ul style="list-style-type: none"> • Population status • All threats |

Recovery Strategy for the Bird's-foot Violet in Ontario

| Relative Priority | Relative Timeframe | Recovery Theme | Approach to Recovery | Threats or Knowledge Gaps Addressed |
|-------------------|--------------------|---|--|---|
| Critical | Short-term | Communication, Education and Outreach | 2.2 Develop and field-test best management practices for oak savanna, e.g., Tallgrass Prairie and Savanna Prescribed Fire Decision Support System (North-South Environmental 2003) and other resources (e.g., Tallgrass Ontario, local stewardship councils). | <ul style="list-style-type: none"> • Habitat loss • Fire suppression |
| Critical | Ongoing | Management, Communication and Education | 2.3 Manage extant sites on public lands according to habitat management plan(s) and monitor results following management action. <ul style="list-style-type: none"> – Continue management at Turkey Point Provincial Park and St. Williams Conservation Reserve in accordance with existing plans. – Ensure that management plans are kept current, and are informed by the best available science. – Increase awareness among park staff (e.g., seasonal operations staff) and visitors of Bird's-foot Violet habitat, and of best management practices in these areas. | <ul style="list-style-type: none"> • Habitat loss • Fire suppression, Trampling and recreational pressure |
| Necessary | Long-term | Research Monitoring | 2.4 Undertake detailed studies and monitoring to determine the success of a variety of management techniques on Bird's-foot Violet response, including: <ul style="list-style-type: none"> – prescribed burn (e.g., optimal frequency, season, fire intensity and burning prescriptions); – mechanical thinning of canopy; – mowing; and – assisted seed dispersal. | <ul style="list-style-type: none"> • Fire suppression • Management and restoration techniques |
| Necessary | Long-term | Management, Restoration | 2.5 If necessary to meet recovery goal, augment existing populations. <ul style="list-style-type: none"> – Working with OMNR, collect seed from Ontario populations to provide a local source for restoration if required, and to guard against the risk of population loss. – Assist seed dispersal at extant populations into areas of apparently suitable habitat. – Monitor, document, and share results | <ul style="list-style-type: none"> • All threats • Management and restoration techniques |

Recovery Strategy for the Bird's-foot Violet in Ontario

| Relative Priority | Relative Timeframe | Recovery Theme | Approach to Recovery | Threats or Knowledge Gaps Addressed |
|---|--------------------|--------------------------------------|---|---|
| 3.0 Monitor populations and habitats regularly, particularly in response to management actions | | | | |
| Critical | Short-term | Inventory, Monitoring and Assessment | 3.1 Conduct surveys of all populations, including: <ul style="list-style-type: none"> – total population census; – accurate GPS mapping of habitat extent and ELC vegetation communities; – measurement of canopy openness (see Thompson 2006); and – assessment of threats and identification of habitat management needs. | <ul style="list-style-type: none"> • Population and habitat status • All threats |
| Necessary | Long-term | Inventory, Monitoring and Assessment | 3.2 Develop and implement a standard monitoring program for all accessible populations, to be conducted every three to five years), including the population and threat assessment tasks above. | <ul style="list-style-type: none"> • Population and habitat status • All threats |
| 4.0 If necessary to meet recovery goal, re-establish and/or introduce populations in suitable habitat within the species' former range | | | | |
| Necessary/Beneficial ⁴ | Long-term | Management, Stewardship | 4.1 Identify potential areas for re-introduction and establishment of Bird's-foot Violet based on (e.g.): <ul style="list-style-type: none"> – presence of a historically documented population; – landowner/land manager commitment; – conservation ownership and management;and – habitat suitability and restoration potential. | <ul style="list-style-type: none"> • Habitat loss and degradation • Small population size |
| Necessary/Beneficial ³ | Long-term | Management, Stewardship | 4.2 Collaboratively with landowners and managers, develop and implement site restoration and management plan(s). | <ul style="list-style-type: none"> • Habitat loss and degradation • Small population size |

⁴ These approaches will be beneficial under any circumstances, but will become necessary to meet the recovery goal, should extant populations be lost.

Recovery Strategy for the Bird's-foot Violet in Ontario

| Relative Priority | Relative Timeframe | Recovery Theme | Approach to Recovery | Threats or Knowledge Gaps Addressed |
|-------------------|--------------------|----------------|--|---|
| Necessary | Long-term | Research | <p>4.3 Undertake applied research to determine:</p> <ul style="list-style-type: none"> - seed bank dynamics and longevity; and - the success of techniques such as assisting seed dispersal, and cultivation methods. | <ul style="list-style-type: none"> • Management and restoration techniques • Seed ecology |

Narrative to Support Approaches to Recovery

Bird's-foot Violet is in critical condition in Ontario. Although it has always been rare in the province, the extent and quality of its oak savanna habitat are now so severely reduced that even maintaining current populations (i.e., abundance, area of occupancy, and range extent) is likely the best scenario that can be achieved. Even this outcome will require a significant and increased commitment by government agencies, non-governmental partners and private citizens.

The extant population on conservation lands (Turkey Point Provincial Park and St. Williams Conservation Reserve) appears to be stable to increasing in population, and is responding well to current management approaches. For these areas, which are in public ownership and regarded as secure, continued management is required according to existing management plans (e.g., OMNR 2005, OMNR 2009). More rigorous monitoring and detailed study of Bird's-foot Violet populations at these locations would lead to a better understanding of the response of this species to different management techniques. A high level of adaptive management that links monitoring, management and research at these sites will benefit all other populations in Ontario, and is considered fundamental to recovery success.

The approaches identified in Table 3 are intended primarily to reduce the real and immediate risk of extirpation of the four populations on private property. One of these populations may already be extirpated. Without a rapid and targeted effort, the three other populations (near Brantford, Vittoria and Forestville) could well be extirpated in the near-term. Current ownership should be determined, and private landowners contacted to discuss the possibility of habitat management. It is recommended that ownership information be kept current, so that new owners may be approached within one or two field seasons.

It will be critical to identify and obtain financial support for the restoration of Bird's-foot Violet and oak savanna habitat on privately owned lands (Brantford, Vittoria and Forestville). The most successful management technique is likely to be prescribed burning, although the high cost of conducting burns almost always requires external funding. Ensuring that existing stewardship funding sources prioritize recovery actions for Bird's-foot Violet habitat restoration is also critical. Unfortunately, other successful conservation incentive programs do not currently apply to habitat conservation for Bird's-foot Violet. For example, the highly successful Norfolk County Alternative Land Use Services (ALUS) pilot program provides funding to farmers only for habitat creation, rather than for long-term protection or management of existing habitat.

Other financial incentives should also be examined to assist in conservation on private lands. The Conservation Land Tax Incentive Program (CLTIP) frequently does not provide significant financial incentives for agricultural landowners (K. Breault, pers. comm. 2012). CLTIP may provide a reasonable incentive for urban and suburban landowners, although habitat mapping guidelines must be developed before this can occur (F. McKay, pers. comm. 2012). Examining and identifying funding sources and other incentives for habitat stewardship on private lands would greatly assist in gaining

the support of private landowners. Securement of these sites through easements or acquisition by land trusts should also be explored.

In the event that private landowners are not interested in species management or other conservation initiatives including easements or acquisition, and no management is known to have occurred, it is reasonable to assume that these populations will be lost. Unless habitat has been converted to other uses, opportunities for restoration should continue to be sought, even if no plants are visible: habitat management probably led to the re-establishment of the James property population, now regulated as part of Turkey Point Provincial Park (G. Buck, pers. comm. 2012).

Without recovery efforts, it is possible that the original distribution of 14 documented populations that ranged across southern Ontario from Lambton County to London and Niagara-on-the-Lake may dwindle to only one population in a small area of Norfolk County. Bird's-foot Violet would then remain only within a very restricted range that represents a small fraction of its former extent and would be increasingly vulnerable to localized threats. In this situation, habitat restoration and population (re-) establishment in Ontario is warranted and should be actively pursued.

Given the likelihood of the above scenario, accomplishing the stated recovery goal will require additional populations. The preferred approach is to re-establish populations at historically documented locations, at least where these are known and ideally under long-term conservation ownership and/or management. Unfortunately, locality data for most extirpated sites is vague, and many sites have been converted to other uses. Areas of oak savanna habitat found at Backus Woods in the 1980s may no longer be suitable (W. Draper, pers. comm. 2012). If Bird's-foot Violet does not re-establish naturally at the Brantford Golf Course savanna, this site is considered suitable for re-introduction (G. Buck, pers. comm. 2012).

An alternative approach could be to consider establishment of populations in suitable habitat within the former Ontario range, even if the species has not previously been documented from that location. Criteria for the selection of such sites would need to be developed and include factors such as landowner commitment, ownership, site suitability, restoration potential, and existing management framework(s). For example, suitable habitat exists or could be restored within the nearby Nursery Tract of the St. Williams Conservation Reserve (R. Gould, pers. comm. 2012). Thompson (2006) also identified sites with suitable but unoccupied habitat; these may provide additional areas for consideration.

Due to its specific habitat requirements, cultivating this species may require expertise and practice. Some information on its cultivation and use in prairie restoration in the United States exists (e.g., Cullina 2000). Local seed sources are not currently available (Gartshore, pers. comm. 2012). Introducing species at risk to the wild in Ontario, either through seed or transplants of local origin, is subject to provisions under the ESA and would require authorization from the Ministry of Natural Resources. The use of seed

collected outside Ontario should not be used for management of Bird's-foot Violet in Ontario.

2.4 Performance Measures

| Objective | Performance Measures |
|---|--|
| 1. Protect extant populations by working collaboratively with landowners. | <ul style="list-style-type: none"> • No populations lost • Current landowners identified and made aware of stewardship opportunities and financial resources • Increase observed in the number of sites protected through stewardship, easement or acquisition • Site access granted for monitoring purposes |
| 2. Manage extant populations to maintain suitable habitat conditions. | <ul style="list-style-type: none"> • Habitat quality improved (i.e., through cutting or prescribed burning) and threats reduced at most sites • Increase observed in the number of land owners actively managing sites |
| 3. Monitor populations and habitats regularly, particularly in response to management actions. | <ul style="list-style-type: none"> • Standard monitoring protocol developed and sites regularly monitored • Current population information available to stakeholders (e.g., municipalities) |
| 4. If necessary to fulfill recovery goal, re-establish and/or introduce populations in suitable habitat within the species' former range. | <ul style="list-style-type: none"> • The current range extent and area of occupancy of Bird's-foot Violet in Ontario are maintained. |

2.5 Area for Consideration in Developing a Habitat Regulation

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

It is recommended that the area prescribed as habitat in a regulation for Bird's-foot Violet include the extent of the Ecological Land Classification (ELC) Ecosite polygon(s) (Lee et al. 1998) within which extant populations of the species occur. It is recommended that accurate inventory and ELC mapping of these habitats be conducted to support the habitat regulation. If plants are close to the edge of an Ecosite polygon, a minimum distance of 50 metres is recommended for regulation. Protecting a minimum radius of 50 metres around the extent of each population represents a precautionary approach to ensure the necessary habitat conditions are maintained and that plants are protected from harm.

Regulating habitat based on the vegetation community, rather than an arbitrary distance from the outer limits of the population, will help to preserve ecological functions required for the recovery of Bird's-foot Violet. Such functions include pollination, seed dispersal and recruitment in suitable habitat.

The level of Ecosite is recommended over the narrower Vegetation Type for two reasons. First, where they occur, Dry Tallgrass Savanna Ecosites (Lee et al. 1998) would be considered as suitable habitat for this species. Second, this broader delineation will encourage preservation of Bird's-foot Violet's very rare, oak savanna habitat in Ontario. All Ontario savanna Vegetation Types, and therefore Ecosites, are considered to be of conservation concern by the NHIC (NHIC 2012). A wider level of protection will help to conserve this species, which is particularly at risk on private lands.

Populations that have not been recently observed should be presumed extant until determined otherwise by the Ontario Natural Heritage Information Centre, following standard guidelines. Habitat at such sites may or may not be suitable for Bird's-foot Violet, but a potential for habitat restoration should exist. Such areas should remain protected in order to preserve the seed bank, in the event that habitat restoration may one day occur. The longevity of seeds in soil is not currently known, but is identified as a knowledge gap.

There is a very small amount of suitable but unoccupied habitat within the species' Ontario range. Should new populations be discovered or established through restoration, it is recommended that a habitat regulation be applied to those sites. Because Bird's-foot Violet may establish in disturbed areas, it is recommended that vegetation communities that are anthropogenic in origin (e.g., Cultural Meadows) also be included in a habitat regulation. However, clearly unsuitable areas, such as manicured lawns, gardens, driveways and structures, should not be included.

Bird's-foot Violet can be cultivated as an ornamental plant and is available for purchase in Canada (L. Campbell, pers. comm. 2012). Most nursery stock in Canada is likely of American origin (M. Gartshore, pers. comm. 2012). It is recommended that horticultural populations and those known to have originated from sources outside Canada be excluded from a habitat regulation.

GLOSSARY

Cleistogamous: A flower that is fertilized and sets seed without opening, common in many violet species.

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

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

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

Ecological Land Classification (ELC): This refers to a standard method of vegetation community classification for southern Ontario. For more information, please see Lee et al. (1998).

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

Mycorrhiza: An association between a fungus and the roots of a vascular plant.

Rhizome: A horizontally creeping underground stem with roots and leaves, which usually persists from season to season.

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

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

Stolon: A stem that grows horizontally; a runner (e.g., as in the strawberry).

Symbiotic: A close association between two or more (usually dissimilar) species, in which each species benefits. Such interactions may be obligate (i.e., both species entirely depend on the other) or facultative (i.e., each can, but does not have to live with the other).

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**Part 3 – *Ontario Bird's Foot Violet and Virginia Goat's-Rue* –
Ontario Government Response Statement, (2014) prepared
by the Ontario Ministry of Natural Resources and Forestry**

Bird's Foot Violet and Virginia Goat's-Rue

Ontario Government Response Statement



PROTECTING AND RECOVERING SPECIES AT RISK IN ONTARIO

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

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

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

GOVERNMENT RESPONSE STATEMENTS

Within nine months after a recovery strategy is prepared, the ESA requires the Ministry to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The recovery strategy for the Bird's-foot Violet (*Viola pedata*) and the recovery strategy for the Virginia Goat's-rue (*Tephrosia virginiana*) in Ontario were completed on November 22, 2013 (http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_rs_brds_ft_en.pdf), and (http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_rs_vrgn_gtsr_en.pdf).

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

Bird's-foot Violet is a stemless violet with five lilac to purple coloured petals. The leaflets of its thin, finely divided leaves resemble the splayed toes of a bird.

Virginia Goat's-rue is a perennial herb in the Pea Family that grows up to 70 cm tall. It produces yellow and pink bi-coloured flowers, and there are typically dense, fine hairs on its stem, branches, leaves, flowers, and fruit that give the plant a silvery appearance.

Given their similar habitat types and threats, the recovery efforts for Bird's-foot Violet and Virginia Goat's-rue are addressed collectively in a single government response statement.

MOVING FORWARD TO PROTECT AND RECOVER BIRD'S-FOOT VIOLET AND VIRGINIA GOAT'S-RUE

Bird's-foot Violet and Virginia Goat's-rue are both listed as endangered species under the ESA, which protects both the plants and their habitats. The ESA prohibits harm or harassment of the species and damage or destruction of their habitat without authorization. Such authorization would require that conditions established by the Ministry be met.

Bird's-foot Violet occurs in eastern North America, and its distribution ranges from Ontario and New York, south to Georgia and west to Minnesota and Texas. Fourteen populations have been observed in southwestern Ontario, only five of which are believed to still exist today. The largest population, which consists of at least 6,500 plants, is located within Turkey Point Natural Area, which includes Turkey Point Provincial Park and St. Williams Conservation Reserve. This population is considered stable or increasing due to ongoing habitat protection and management, including prescribed burns. Most plants within Turkey Point Provincial Park occur along a hydro corridor. The four remaining populations are located on private lands, and three of those populations have fewer than 10 plants.

Like Bird's-foot Violet, Virginia Goat's-rue occurs in eastern North America. Its distribution ranges from Ontario and Minnesota, south to Florida and west to Texas. Less than one percent of the total distribution of the species is in Canada, where six populations of the species have been observed, all within Norfolk County, Ontario. Only two of these populations continue to exist today; the largest of these, with an estimated 566 individual plants, occurs within the Turkey Point Natural Area. The other population is located on private land; recent population estimates at this site are lacking, as the site has not been accessed since 2001. Historically, the species was documented from four additional locations in Norfolk County; however the species has not been observed at any of these locations in more than 20 years, despite considerable targeted effort.

Bird's-foot Violet and Virginia Goat's-rue can both be found in dry, open, sandy habitats and are commonly associated with oaks or pines. In Ontario, both species occur in oak savanna habitats, dominated by Black Oak (*Quercus velutina*), White Oak (*Quercus alba*) or Red Oak (*Quercus rubra*). Virginia Goat's-rue also occurs in woodland habitats dominated by oaks and pines.

The predominant threats to Bird's-foot Violet and Virginia Goat's-rue in Ontario are habitat loss due to alteration of the natural disturbance regime (i.e., fire suppression), as well as conversion to agricultural lands and housing developments. Other threats include management and recreational pressures, invasive species, and erosion at specific sites.

Bird's-foot Violet and Virginia Goat's-rue are both endemic to rare and fragmented ecosystems in Ontario. Ever since plant inventories were first conducted in the province, neither species has been found to be common. The distribution and abundance of Bird's-foot Violet and Virginia Goat's-rue prior to this period are unknown. For both these species, recovery is focused on protecting and enhancing remaining habitat, and enabling increases to existing populations. Because only a few, small, isolated populations remain, and approaches to protect and improve the habitat of these species are generally well understood, recovery is also focused on investigating the feasibility of re-establishing the species at historically occupied sites.

The government's goal for the recovery of Bird's-foot Violet and Virginia Goat's-rue in Ontario is to maintain the provincial population of each species at, or enable natural increases to, sustainable levels, and re-establish the species at sites they have historically occupied if feasible and appropriate.

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

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

GOVERNMENT-LED ACTIONS

To help protect and recover Bird's-foot Violet and Virginia Goat's-rue, the government will directly undertake the following actions:

- Continue to undertake periodic monitoring of Bird's-foot Violet and Virginia Goat's-rue populations, habitat conditions, and threats to the species and their habitat within Turkey Point Provincial Park.
- Continue to undertake ecosystem enhancement activities such as prescribed burning and invasive species control within Turkey Point Provincial Park, as resources permit.
- Continue to work with partners to undertake monitoring, habitat management, research to address significant knowledge gaps, and to increase awareness and promote stewardship of species at risk including Bird's-foot Violet and Virginia Goat's-rue in St. Williams Conservation reserve.
- Continue to implement the Ontario Invasive Species Strategic Plan to address the invasive species (e.g., Multiflora Rose (*Rosa multiflora*), Autumn Olive (*Elaeagnus umbellata*), Garlic Mustard (*Alliaria petiolata*)) that threaten Bird's-foot Violet and Virginia Goat's-rue.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Bird's-foot Violet and Virginia Goat's-rue data to the Ministry's central repository at the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect the Bird's-foot Violet and Virginia Goat's-rue and their habitat through the ESA.
- Support conservation, agency, municipal and industry partners, and Aboriginal communities and organizations to undertake activities to protect and recover the Bird's-foot Violet and Virginia Goat's-rue. Support will be provided where appropriate through funding, agreements, permits with appropriate conditions, and/or advisory services.
- Encourage collaboration, and establish and communicate annual priority actions for government support in order to reduce duplication of efforts.

GOVERNMENT-SUPPORTED ACTIONS

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

Focus Area: Protection and Management

Objective: Improve habitat conditions and promote increases in the distribution and abundance of Bird's-foot Violet and Virginia Goat's-rue.

Actions:

1. (HIGH) Develop and implement site-specific management strategies to manage and improve habitat where these species occur, with consideration for other rare species and invasive species present on site. Monitor the effectiveness of actions taken and revise strategies, as appropriate, based on the best available information. Strategies may include, but are not limited to:
 - prescribed burns to prevent woody succession;
 - woody vegetation removal (e.g., where burns are not feasible); and,
 - invasive species control.
2. Investigate whether it is feasible and appropriate to re-establish Bird's-foot Violet or Virginia Goat's-rue at sites historically occupied by the species, and where it is deemed feasible and appropriate, undertake actions to do so.

Focus Area: Research

Objective: Increase knowledge about habitat management for Bird's-foot Violet and Virginia Goat's-rue, as well as factors influencing reproductive success and propagation.

Actions:

3. (HIGH) Undertake research to determine optimal conditions at which habitat management techniques should be conducted (e.g., optimal temperature and frequency for prescribed burns).
4. Undertake research to:
 - determine factors influencing reproductive success of Bird's-foot Violet and Virginia Goat's-rue (e.g., conditions under which pollination, germination, and recruitment are optimal; seed bank characteristics and longevity); and
 - identify the best practices for propagation (including assisted dispersal, cultivation, or transplantation) of these species.

Focus Area: Inventory and Monitoring

Objective: Confirm where the species remain and improve understanding of the species and their habitat at these sites.

Actions:

5. Survey the sites where Bird's-foot Violet and Virginia Goat's-rue occur on private land to confirm whether the species remain at these sites and, where they are found to remain, determine population sizes. Surveys should be conducted using a consistent, standardized methodology.
6. Undertake regular monitoring of the species demographics, health, habitat conditions, and threats at all sites where they occur.

Focus Area: Awareness
Objective: Increase awareness and stewardship of the species and their habitat.

Actions:

7. Increase awareness among land owners and the public about Bird's-foot Violet and Virginia Goat's-rue, including:
 - identification of the species;
 - the species' habitat requirements;
 - protection afforded to the species and their habitat under the ESA; and,
 - actions they can take to minimize threats, including habitat loss, invasive species, trampling, and erosion.

IMPLEMENTING ACTIONS

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

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

REVIEWING PROGRESS

The ESA requires the Ministry to conduct a review of progress towards protecting and recovering a species not later than five years from the publication of this response statement. The review will help identify if adjustments are needed to achieve the protection and recovery of Bird's-foot Violet and Virginia Goat's-rue.

ACKNOWLEDGEMENT

We would like to thank all those who participated in the development of the Recovery Strategy for the Bird's-foot Violet (*Viola pedata*) in Ontario and the Recovery Strategy for the Virginia Goat's-rue (*Tephrosia virginiana*) in Ontario for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at ontario.ca/speciesatrisk
Contact your MNRF district office
Contact the Natural Resources Information Centre
1-800-667-1940
TTY 1-866-686-6072
mnr.nric.mnr@ontario.ca
ontario.ca/mnr