

# Management Plan for the Western Blue Flag (*Iris missouriensis*) in Canada

## Western Blue Flag



2017



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

## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)<sup>2</sup> 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 management plans for listed species of special concern 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 Western Blue Flag and has prepared this management plan, as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the Province of Alberta, as per section 66(1) of SARA.

Success in the conservation 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 plan 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 plan for the benefit of the Western Blue Flag and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

In 2002, the Canada Western Blue Flag Maintenance/Recovery Team prepared a *Maintenance and Recovery Plan for Western Blue Flag (*Iris missouriensis*) in Canada* (further referred to as AB Maintenance/Recovery Plan) for Alberta Environment and Parks. The Government of Canada can adopt or incorporate a provincial recovery document as a federal recovery document, adding relevant sections to make it SARA-compliant. However, since the AB Maintenance/Recovery Plan is outdated, this federal management plan does not adopt it, but incorporates as much information from the AB Maintenance/Recovery Plan as possible.

## Acknowledgments

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<sup>2</sup> <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6B319869-1%20>

## Executive Summary

Western Blue Flag is a perennial herb from the Iris family. Leaves are blue-green and sword-shaped, folded lengthwise around the base of the stem. Flowering stalks produce two to four showy pale to deep blue flowers with a bearded yellow spot that has purple veins radiating outward. The species is mostly confined to the transition zone between riparian habitat and upland habitat in areas with high soil moisture in spring and dry conditions later in summer.

Western Blue Flag reaches the northern limit of its range in southwestern Alberta, Canada. There are 15 extant populations, 1 historic population, and 2 extirpated populations in Alberta. Of the 15 extant populations, 10 are considered to be native (naturally occurring). This management plan deals only with the extant native populations. The most recent population estimate for the extant native populations in Canada was 110,000-120,000 stems. Western Blue Flag was assessed as special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is listed as special concern under the *Species at Risk Act* (SARA).

The most significant threats to Western Blue Flag are continued habitat loss, fragmentation and degradation from trampling or overgrazing by livestock, and invasive alien plant species. Threats of a lower significance include fire suppression, excavation of soil, alteration of hydrology (sewer outlet), and encroachment of problematic native species (woody vegetation encroachment).

The management objective is to ensure long-term maintenance of all extant native populations in Canada including any newly located or re-discovered native populations.

Broad strategies and conservation measures have been identified to help achieve the management objectives.

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## 1. COSEWIC\* Species Assessment Information

**Date of Assessment:** April 2010

**Common Name (population):** Western Blue Flag

**Scientific Name:** *Iris missouriensis*

**COSEWIC Status:** Special Concern

**Reason for Designation:** This showy perennial is restricted to ten native sites and is also present at a few sites where it is believed to have been introduced. It occurs primarily in the grasslands of southern Alberta. Several new populations have been discovered since the species was last assessed. The area occupied and total population size of native plants are now known to be larger than previously determined. The total Canadian population appears to be stable but fluctuates in size. The species is subject to on-going competition from invasive plants, but trampling in areas heavily grazed by cattle has been largely mitigated by recovery actions.

**Canadian Occurrence:** Alberta

**COSEWIC Status History:** Designated Threatened in April 1990. Status re-examined and confirmed in May 2000. Status re-examined and designated Special Concern in April 2010.

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

## 2. Species Status Information

Western Blue Flag (*Iris missouriensis*) is listed as special concern under Schedule 1 of the *Species at Risk Act* (SARA) and as special concern under Alberta's *Wildlife Act*. The conservation status of Western Blue Flag throughout its range in North America is described in Table 1. It is estimated that Canada holds less than 1% of the species' global range (COSEWIC 2010), although this is difficult to estimate because the species' abundance is not tracked in many states in the U.S. (Table 1).

**Table 1. Conservation Status of Western Blue Flag (NatureServe 2016a).**

Global (G) Rank <sup>a</sup>	National (N) Rank <sup>a</sup>	Sub-national (S) Rank <sup>a</sup>
G5	Canada: N2  United States: N5?	Canada: Alberta (S2), British Columbia <sup>b</sup> (SNA)  United States: Arizona (SNR), California (SNR), Colorado (SNR), Idaho (SNR), Minnesota <sup>c</sup> (SNR), Montana (S4), Nebraska (S1), Nevada (SNR), New Mexico (SNR), North Dakota (S2), Oregon (SNR), South Dakota (SNR), Utah (SNR), Washington (SNR), Wyoming (S4)

<sup>a</sup> Rank: 1– critically imperiled; 2– imperiled; 3- vulnerable to extirpation or extinction; 4- apparently secure; 5– secure; NR – status not ranked; ? – inexact or uncertain

<sup>b</sup> Isolated populations in British Columbia thought to be *Iris missouriensis* have been reclassified as *Iris setosa* Pallas ex Link (COSEWIC 2010). Therefore, this Management Plan only considers the Alberta population as it is the single designatable unit under COSEWIC for this species (COSEWIC 2010).

<sup>c</sup> This species has been reported in Minnesota but it is not considered part of the wild flora of the state (Ownbey and Morley 2009).

### 3. Species Information

#### 3.1. Species Description

Western Blue Flag is a long-lived perennial herb from the Iris family. Plants can reproduce asexually through the rhizomes (horizontal underground stem), or sexually through seed germination. Plants are typically found in small clumps that are genetically identical and it is estimated that clumps can persist for at least 25 years or longer (Alberta Sustainable Resource Development and Alberta Conservation Agency [ASRD and ACA] 2005, COSEWIC 2010). Tufts of leaves are produced from thick underground



**Figure 1.** Western Blue Flag flower. Photo: © Joyce Gould.

rhizomes that have a branching and linear growth pattern. Leaves are blue-green and sword-shaped, folded lengthwise around the base of the stem. Flowering stalks reach 30-60 cm, are often leafless, and produce two to four flowers with showy pale to deep blue or, rarely, white, petals; the sepals (leaf-like flower part in the outermost whorl of the flower) have a bearded yellow spot with purple veins radiating outwards (Fig. 1). Flowers are not produced until the second or third year after germinating from seed,

with fruiting stems further persisting for one year or more (ASRD and ACA 2005, Gould and Cornish 1999). Flowering occurs from mid-June to early July in Alberta with flowers blooming sequentially. Seed capsules are 2-5 cm long and oblong, with three green chambers that gradually turn brown as they ripen. About 20-80 dark brown, smooth seeds are produced per capsule, dispersing in August mainly through gravity, wind and water (ASRD and ACA 2005, COSEWIC 2010). The seed germination period is likely from one to three months and requires cold wet stratification (exposure to freezing temperatures and moisture over the winter and spring) (ASRD and ACA 2005).

### 3.2. Species Population and Distribution

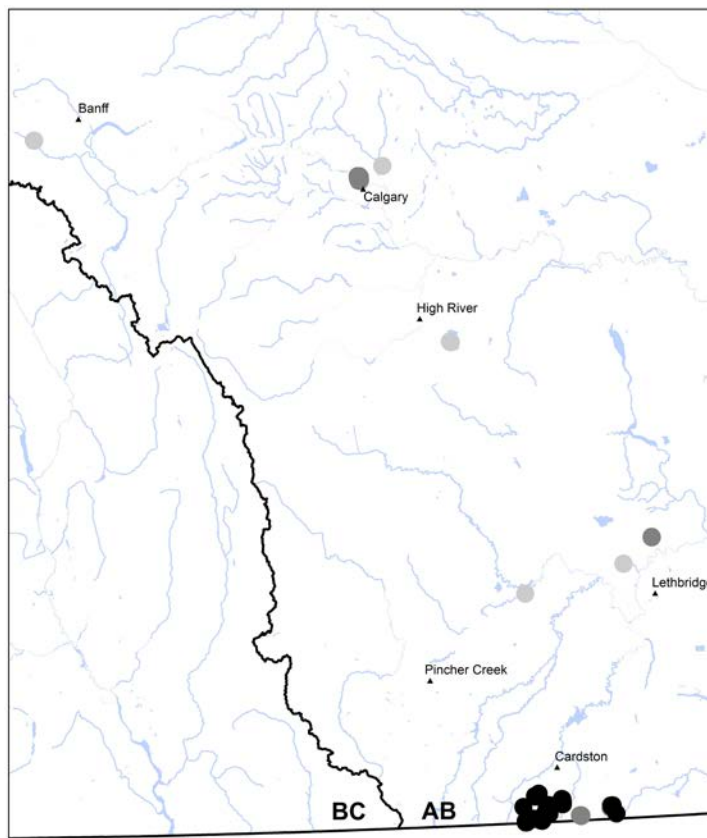
Western Blue Flag is widespread in western North America. It reaches the northern limit of its range in southwestern Alberta (Fig. 2), occurring along the US-Canada border from the western part of the Milk River Ridge to west of Carway and Police Outpost Provincial Park (Canadian Western Blue Flag Maintenance/Recovery Team [CWBFMRT] 2002, ASRD and ACA 2005, COSEWIC 2010). The majority of the species' range is in the western United States, extending from the US-Canada border southeast to New Mexico and west to California. The southern limit of the range reaches into northern Mexico (Fig. 2)



**Figure 2.** Global range of Western Blue Flag in North America.



In Alberta, as of 2015, there are fifteen extant<sup>3</sup> populations<sup>4</sup>, one historic<sup>5</sup> population and two extirpated<sup>6</sup> populations (Figure 3, Appendix A). Of the fifteen extant populations, ten are considered to be native (naturally occurring), one is considered introduced (Frank Lake) and four have unknown origins but are likely introduced (Calgary International Airport, Banff National Park, Fort MacLeod, Park Lake) (COSEWIC 2010). The populations at Frank Lake, Calgary, and Banff appear to be beyond the natural range for the species. The Frank Lake population is considered introduced as it was found with other cultivated irises. No plants were found at the Frank Lake population in 2004 and it may have been extirpated due to competition with non-native plant species (ASRD and ACA 2005, COSEWIC 2010); however, until extirpation is confirmed, this population will be considered extant. The Calgary International Airport population is 300 km from the nearest native Western Blue Flag population, and the habitat attributes are not similar to the



**Figure 3.** Range of Western Blue Flag in Canada. [Black circles are extant native populations, light gray circles are extant populations of unknown or introduced origins, and dark gray circles are historic or extirpated populations.]

<sup>3</sup> Extant means the population or occurrence has been recently verified as still existing, information on the location is accurate, and habitat still exists at the time of writing the management plan (NatureServe 2016b).

<sup>4</sup> For the purpose of this management plan, an occurrence is a grouping of plants separated from another grouping of plants, either temporally or spatially, and sometimes referred to as a patch, source feature, or sub-element occurrence. Each population is composed of one or more occurrences and for the purposes of this management plan we are considering an element occurrence, as defined by NatureServe (2016c), to be analogous to a population.

<sup>5</sup> Historic means that the habitat still exists, or could exist with proper management, but presence of the species has not been reconfirmed at that occurrence or population for 25 or more years. In some cases, historic may also indicate an occurrence or population greater than 25 years old that also has inaccurate or vague locational information, making it difficult or impossible to confirm relocations (NatureServe 2016b).

<sup>6</sup> Extirpated either means that conditions or habitat no longer exist at an occurrence or population to support the species, or sufficient surveys have taken place at the occurrence or population over an adequate time period (over 20 years) and during good growing years, conducted by experienced surveyors, yet failed to relocate the species at the occurrence or population (NatureServe 2016b).

native populations; the size and health of the population indicate it may have been here a while although its origins are unknown (Romanchuk et al. 2004). The origin of the Banff National Park population has not been confirmed despite the advanced age of the plants suggesting that it has existed there for more than 25 years (ASRD and ACA 2005, COSEWIC 2010). While the Fort MacLeod population does not occur in typically suitable habitat, it is situated in the Oldman River flood plain and suitable habitat likely existed there in the past (COSEWIC 2010). The Park Lake population was thought to be extirpated (ASRD and ACA 2005) but surveys as recent as 2011 confirmed that plants still exist at this location. The historic population (Mary Lake) is of native origin but plants have not been observed there for over 25 years (Appendix A). However, since habitat still exists and only one survey has taken place in those 25 years, extirpation has not been confirmed so it will be considered historic for now (COSEWIC 2010); the ASRD and ACA update status report (2005) considers this population to no longer exist. Both extirpated populations (University of Calgary and Picture Butte) were likely introduced (COSEWIC 2010). The University of Calgary population was removed in 2003 due to construction and topsoil stripping (ASRD and ACA 2005). This management plan will deal only with the ten populations which are extant and native (Appendix A) (CWBFMRT 2002; ASRD and ACA 2005).

The most recent population estimate for the extant native populations in Canada was 110,000-120,000 stems at 12 “sites” in 2009 (COSEWIC 2010). Population estimates have fluctuated over the years and should be interpreted with caution as they are not comparable and are not an indication of trend for the following reasons: COSEWIC (COSEWIC 2010) and ASRD (Romanchuk et al. 2004; ASRD and ACA 2005) define and spatially delineate “sites” differently; surveys were completed at different sample sites among years; an increasing number of sites were surveyed and an increasing number of occurrences were reported with each successive survey year. Monitoring data of 11 “sites” over 5 years indicated considerable fluctuation in number of stems produced each year, but suggested the overall trend is stable (ASRD and ACA 2005, Ernst 2009 in COSEWIC 2010). COSEWIC (2010) estimated the extent of occurrence<sup>7</sup> of the 10 native extant populations to be 250 km<sup>2</sup> and the index area of occupancy<sup>8</sup> to be 68 km<sup>2</sup> (2x2 km grid), with the actual area occupied (area of occupancy)<sup>9</sup> to be around 3 km<sup>2</sup>.

### 3.3. Needs of the Western Blue Flag

Native populations of Western Blue Flag occur in the Foothills Fescue and Foothills Parkland Natural Subregions of Alberta at elevations between 914 m and 2800 m. These subregions receive higher precipitation, have warmer winters and a shorter growing season than any of the other grassland natural subregions in Alberta (Natural

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<sup>7</sup> Extent of occurrence, as defined by COSEWIC, is “the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species” (COSEWIC 2015).

<sup>8</sup> Index area of occupancy is calculated by counting the total number of 2 x 2 km grid squares that contain the species (COSEWIC 2009).

<sup>9</sup> Area of occupancy is the portion within or range of a species that is actually occupied by the species (COSEWIC 2015).

Regions Committee 2006). The growing season is an average of 90 days with maximum precipitation received in May and June and mean temperatures between 11°C to 13°C (Natural Regions Committee 2006).

Western Blue Flag has a narrow environmental tolerance, occupying a unique habitat niche within some of the most threatened landscapes in Alberta (COSEWIC 2010). It is most often found in the transition zone between riparian habitat and upland habitat in areas characterized by high soil moisture in spring and dry conditions later in summer (CWBFMRT 2002). Level to gently sloping sites where soils are predominantly dark brown or black chernozems (fertile black soil rich in organic material) are wet in spring and drain slowly, creating drier, warmer conditions by mid summer (ASRD and ACA 2005, COSEWIC 2010). These sites are ideal as Western Blue Flag cannot tolerate heavy shading or permanently saturated soils (ASRD and ACA 2005, COSEWIC 2010). Such habitat often occurs along ephemeral drainages, stream margins, seepage springs, moist to wet meadows and moist depressions within willow thickets, shrub and sedge communities (Wallis and Bradley 1990, Gould 1999, ASRD and ACA 2005, COSEWIC 2010). Western Blue Flag has rarely been found on drier upland slopes in Rough Fescue dominated communities which receive early season moisture from snowmelt or subsurface flow (CWBFMRT 2002, COSEWIC 2010). Detailed descriptions of the known Western Blue Flag sites in Alberta can be found in the AB Maintenance and Recovery Plan (CWBFMRT 2002).

### **Limiting Factors**

Small populations at the periphery of their ranges are sometimes, but not always, limited by genetic and demographic threats which increase with a decrease in population size (Noss et al. 1997). Peripheral populations are therefore more vulnerable to extinction due to low immigration rate, disrupted pollinator relationships, and other density-related factors (Vucetich and Waite 2003). Research on the genetic diversity of Western Blue Flag populations in southern Alberta and northern Montana through DNA analysis indicated that there has been some gene flow amongst these populations (McPherson 2003). Demographic studies on populations in Alberta have not yet been conducted (ASRD and ACA 2005).

It is unknown which pollinating species visit Western Blue Flag in Alberta, but flowers are adapted for pollination primarily by bees (*Bombus* spp.) and flies (Diptera), with thrips (Thysanoptera), ants (Hymenoptera), hummingbirds (e.g. *Selasphorus platycercus* in Arizona), and various butterflies and moths (Lepidoptera) known to visit Western Blue Flag in other regions (Lyon 1973, Faegri and van derPijl 1979, Eastman 1995). The role of pollinators is unknown. It is also unknown whether Western Blue Flag is able to self-pollinate; the style and stigma face away from the anthers suggesting that self-pollination is unlikely to occur (ASRD and ACA 2005). Given that Western Blue Flag occurs in small isolated clumps with relatively low flowering density and that there is usually a minimum density of individuals required to attract pollinators (Robson 2013), disruption of pollination biology is a potential limiting factor. However, it has been reported that one clump was able to sustain itself, without flowering, for 25 years (Wallis 1989).

## 4. Threats

### 4.1. Threat Assessment Update

The threat assessment for the Western Blue Flag is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational). In carrying out the threat assessment, only present and future (within a 10-year timeframe) threats are considered. Threats are characterized here in terms of scope, severity, and timing. The overall threat “impact” reflects a reduction of a species population or decline/degradation of the area of an ecosystem and is calculated from scope and severity. See the table footnotes for details on how the values are assigned in the table (Table 2). Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats are presented in the narrative section. Limiting factors are not considered during this assessment process.

**Table 2.** Threat Classification Table for Western Blue Flag

Threat #	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats/Comments
2	Agriculture & aquaculture	High - Low	Pervasive	Serious – Slight	High	
2.1	Annual & perennial non-timber crops	Negligible	Negligible	Extreme	Moderate – Low	Habitat loss and direct loss of plants from cultivation or conversion to tame pasture.
2.3	Livestock farming & ranching	High – Low	Pervasive	Serious – Slight	High	Habitat degradation from heavy trampling, pugging or hummocking, overgrazing, alteration of drainage patterns/hydrology. Direct loss of plants from heavy trampling.
5	Biological resource use	Unknown	Unknown	Unknown	Moderate - Low	
5.2	Gathering terrestrial plants	Unknown	Unknown	Unknown	Moderate – Low	Direct loss of plants or plant parts from collection for horticultural or medicinal purposes.
6	Human intrusions & disturbance	Low	Small	Extreme	High	
6.3	Work & other activities	Low	Small	Extreme	High	Habitat loss and direct loss of plants from excavation of soil.
7	Natural system modifications	Low	Small	Moderate – Slight	High	
7.1	Fire & fire suppression	Low	Small	Moderate – Slight	High	Habitat degradation from fire suppression and change in the natural fire regime.

Threat #	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats/Comments
7.2	Dams & water management/use	Unknown	Unknown	Unknown	Moderate – Low	Habitat degradation from development of drainage projects and drainage/filling of wetlands.
7.3	Other ecosystem modifications	Negligible	Negligible	Slight	High	Habitat degradation from grazing exclusion and change in the natural grazing regime.
8	Invasive & other problematic species & genes	Medium – Low	Pervasive	Moderate – Slight	High	
8.1	Invasive non-native/alien species	Medium – Low	Pervasive	Moderate – Slight	High	Habitat degradation from non-native and invasive alien plant species.
8.2	Problematic native species	Low	Small	Moderate – Slight	High	Habitat degradation from woody vegetation encroachment.
8.3	Introduced genetic material	Unknown	Unknown	Unknown	Unknown	Degradation in plant vigour/viability from domestic seed contaminating the native gene pool.
9	Pollution	Low	Small	Slight	High	
9.1	Household sewage & urban waste water	Low	Small	Slight	High	Habitat degradation from a sewer outlet.
9.3	Agricultural & forestry effluents	Unknown	Unknown	Extreme	High	Direct loss of plants from indirect and direct application of herbicides.
11	Climate change & severe weather	Negligible	Negligible	Extreme	Moderate – Low	
11.2	Droughts	Unknown	Unknown	Unknown	Moderate – Low	Habitat degradation from natural conditions of drought.
11.4	Storms & flooding	Negligible	Negligible	Extreme	Moderate – Low	Habitat degradation and/or direct loss of plants from natural flooding of the lake.

<sup>a</sup> **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

<sup>b</sup> **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

<sup>c</sup> **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

<sup>d</sup> **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

## 4.2. Description of Threats

Threats to Western Blue Flag in Alberta are broadly categorized as habitat loss, habitat degradation, alteration of hydrology, competition from invasive species, and direct killing of plants.

### IUCN Threat 2. Agriculture & aquaculture

#### *Threat 2.1 Annual & perennial non-timber crops*

Historical conversion of native prairie and wetlands to cultivated cropland and pasture land likely contributed to the loss of Western Blue Flag habitat and habitat fragmentation, although it is possible that this species has always been rare in Canada (ASRD and ACA 2005). In the Foothills Grassland Natural Region of Alberta, it was estimated that 750 km<sup>2</sup> of potentially suitable Western Blue Flag habitat existed before European settlement (Wallis 1989). By the 1980s, less than 100 km<sup>2</sup> remained uncultivated (Wallis 1989). It has been estimated that 63% of grassland in the settled portion of Alberta has been lost through historical cultivation (Strong et al. 1993). At least one population of Western Blue Flag remains threatened by cultivation (COSEWIC 2010).

#### *Threat 2.3 Livestock farming & ranching*

Grazing by cattle is pervasive throughout the Canadian range of Western Blue Flag. The impact of grazing on Western Blue Flag is likely determined by timing, duration and intensity of combination of factors including grazing, climatic conditions (e.g. drought), and fire (Biondini et al. 1998, Knapp et al. 1999). Light to moderate grazing appears to be beneficial to Western Blue Flag as the species spreads quickly by vegetative reproduction (rhizomes) once competing vegetation and litter is removed, and it can withstand light trampling from grazers (ASRD and ACA 2005, COSEWIC 2010). Moderate to heavy grazing at one population in Alberta was found to reduce the number and vigour of plants, and trampling from overgrazing at several populations has been observed to damage rhizomes and flowers (ASRD and ACA 2005). However, highly favourable habitat conditions appeared to enable the Basin population (Appendix A) to tolerate heavy grazing pressure (ASRD and ACA 2005), although severe trampling and pedestalling have been reported recently at the Basin population as well as at Carway and Whiskey Gap (Appendix A, ACIMS 2015). Overgrazing has been listed as a threat to six Western Blue Flag populations with the main effects from trampling, pugging, and hummocking either killing the plants directly or contributing to habitat degradation through altering drainage patterns and hydrology (Wallis 1989, Wallis and Bradley 1990, ASRD and ACA 2005). Moisture retention in soils is a key aspect of Western Blue Flag habitat and heavy trampling from cattle causing changes in drainage patterns has been known to decrease plant vigour at at least one population (COSEWIC 2010). Effects of overgrazing and trampling on Western Blue Flag were found to be exacerbated during a prolonged drought in 2000 and 2001 (CWBFMRT 2002). Grazing at an intensity, frequency and duration appropriate for the needs of Western Blue Flag is likely not

detrimental in a system that evolved under grazing pressure, and in fact, is likely beneficial by preventing succession, maintaining vegetation structure, reducing invasive alien plant species, and maintaining range condition (Milchunas et al. 1989, Milchunas et al. 1992, Samson and Knopf 1994, Biondini et al. 1998, COSEWIC 2010). Range management plans and stewardship agreements that have been created for the majority of populations through the MULTISAR program in Alberta should produce grazing conditions appropriate for the species and start mitigating this threat (see section 6.1).

## **IUCN Threat 5. Biological resource use**

### *Threat 5.2 Gathering terrestrial plants*

Digging of rhizomes and collecting of seed for horticultural and medicinal uses is a potential threat to Western Blue Flag. The extent of collection in Alberta is currently unknown and the impact on the long-term viability of populations is unknown (ASRD and ACA 2005).

## **IUCN Threat 6. Human intrusions and disturbance**

### *Threat 6.3 Work & other activities*

Digging and excavation of soil has been listed as occurring within two native Western Blue Flag populations (ACIMS 2015, unpubl. data). Soil excavation results in direct loss of plants and habitat, alters hydrology, fragments habitat, and increases the potential for invasive plant species to colonize disturbed areas.

## **IUCN Threat 7. Natural system modifications**

### *Threat 7.1 Fire & fire suppression*

Western Blue Flag habitat would have evolved under a natural disturbance regime that included ecological processes such as grazing and fire, acting independently or together (Daubenmire 1968, White 1979, Collins 1987, Lesica and Cooper 1999). Changes in land use practices since European settlement have resulted in a reduction in the frequency and extent of prairie fires (Higgins et al. 1989). Suppressing fire allows trees and shrubs to invade prairies, allows invasive weed species to gain a foothold, and has been a contributing factor in declines of other prairie plant species (Kaye et al. 2001). Indirect results of fire suppression such as woody vegetation encroachment (see threat 8.2), increased competition from native and non-native species (see threat 8.1, 8.2), low site diversity, and excessive litter build-up were reported. Excessive litter build-up at two populations was reported to have suppressed or delayed flowering. It is unknown how this will affect Western Blue Flag population viability in the long term. Encroachment and thatch build-up can result in increased competition for limited resources, such as sunlight, can limit availability of suitable sites for establishment, and can alter moisture and temperature levels which may affect

germination. Suppressed flowering and increased competition for resources may affect reproduction by seed and seedling establishment and survival. The effect of fire in terms of frequency, intensity, and duration on Western Blue Flag populations in Alberta is unknown however, in California the response of Western Blue Flag and other understory perennial species with rhizomes was enhanced after a fire (COSEWIC 2010).

#### *Threat 7.2 Dams & water management/use*

Development of cattle watering facilities and drainage projects has the potential to alter the water table enough to make habitat unsuitable for Western Blue Flag (CWBFMRT 2002). Wetlands in the Foothills Grassland Natural Region are also under pressure from being drained and filled in (ASRD and ACA 2005). The extent of this threat and the impact on the long-term viability of populations in Alberta is unknown.

#### *Threat 7.3 Other ecosystem modifications*

Pre-settlement habitat containing Western Blue Flag would have evolved under periodic natural disturbances like fire, grazing and drought (Samson and Knopf 1994). These disturbances interacted independently and/or together (Collins 1987) to maintain the open habitat suitable for species like Western Blue Flag. Exclusion of grazing can result in thatch and litter build-up, increased invasive alien plant species (see threat 8.1), and increased competition for resources; grazing exclusion may be contributing to a decline in the number of stems at one population (ASRD and ACA 2005, COSEWIC 2010). Excessive litter build-up at two other populations was reported to have suppressed or delayed flowering. Suppressed flowering and increased competition for resources may affect reproduction by seed and seedling establishment and survival.

### **IUCN Threat 8. Invasive & other problematic species & genes**

#### *Threat 8.1 Invasive non-native/alien species*

Invasive alien plants can pose a direct threat through competition because they are aggressive and can displace native species, decrease species diversity or richness through their superior competitive ability and/or result in overall negative effects on ecosystem functioning (Wilson 1989, Reader et al. 1994, Dilleuth et al. 2009). Competition from non-native plant species such as Smooth Brome (*Bromus inermis*), Kentucky Bluegrass (*Poa pratensis*), Timothy Grass (*Phleum pratense*), Dandelion (*Taraxacum officinale*), Canary Reed Grass (*Phalaris arundinacea*), and Quack Grass (*Elymus repens*) was listed as a threat to all Western Blue Flag populations (CWBFMRT 2002). In 1987, the primary vegetation at the Police Outpost Provincial Park (Alberta) population was native grasses, but this changed over a period of just 11 years to a plant community dominated by Smooth Brome (ASRD and ACA 2005). Also, in just three years (2002-2004), a considerable increase in the amount of Kentucky Bluegrass was noticed within several Western Blue Flag populations (Ernst 2003). Non-native plants such as Smooth Brome and Kentucky Bluegrass prefer similar habitats as those



populated by Western Blue Flag because they are also dependent on moisture for reproduction. Invasion of these areas can threaten rhizome stability and survival of Western Blue Flag (Adams et al. 2003). The threat of invasive alien species is expected to continue and increase in future years.

### *Threat 8.2 Problematic native species*

In the absence of natural disturbances like fire or grazing, or during extended wet climatic periods, woody vegetation can encroach leading to a change in the plant community (Higgins et al 1989, Milchunas et al. 1989, Milchunas et al. 1992, Samson and Knopf 1994, Hayes and Holl 2003). The disruption of the natural disturbance regime has allowed encroachment of woody vegetation (Trembling Aspen (*Populus tremuloides*), Chokecherry (*Prunus virginiana*), willows (*Salix ssp.*), Shrubby Cinquefoil (*Dasiphora fruticosa*)) and increased competition from other native species (sedges (*Carex spp.*), Common Yarrow (*Achillea millefolium*)) at five populations. Western Blue Flag is not tolerant of heavy shading (COSEWIC 2010) and woody vegetation encroachment can alter light levels enough to make the habitat unsuitable. Competition for limited resources, such as sunlight and moisture, can limit availability of suitable sites for seedling establishment, and can alter moisture and temperature levels which may affect seed germination. Vegetative reproduction may give Western Blue Flag somewhat of an advantage as it allows the plant to spread quickly when competing vegetation is removed (COSEWIC 2010).

### *Threat 8.3 Introduced genetic material*

Western Blue Flag seed can be purchased from many gardening stores although the source of the seed is unknown (presumed to be from the United States) (COSEWIC 2010). Domestic cultivars could potentially invade Western Blue Flag habitat and contaminate the native gene pool (COSEWIC 2010). Effects on population viability could include increased susceptibility to disease or cold weather (ASRD and ACA 2005). Of the fifteen extant populations in Alberta, four have unknown origins but are likely introduced and one is considered introduced as it was found with other cultivated irises (COSEWIC 2010).

## **IUCN Threat 9. Pollution**

### *Threat 9.1 Household sewage & urban waste water*

Individuals within one population were reported to be within 7 m of a sewer outlet (ACIMS 2015). Sewage drainage has the potential to alter hydrology (flooding) and change the nutrient content and PH of soil making habitat unsuitable for Western Blue Flag. The impacts of sewage drainage on Western Blue Flag are currently unknown.

### *Threat 9.3 Agricultural & forestry effluents*

The use of agricultural herbicides is a widespread range management tool in Alberta. However the use of herbicides in areas containing Western Blue Flag is unknown (ASRD and ACA 2005). Broad-leaf herbicides have the potential to kill Western Blue Flag either through off-site drift when spraying adjacent cropland or through inadvertent but direct application when spraying pastures. The role of pollinators in Western Blue Flag reproduction is unknown but disruption of pollination biology is a potential limiting factor. Reducing flowering plants through herbicide use, as well as spraying insecticides to control insect pest species, can both reduce pollinators and potentially affect reproduction of Western Blue Flag. Declining native bee populations across North America have been observed to coincide with declines in native plant populations, although it is not clear whether bee declines are causing plant declines or vice versa (Nabhan and Buchmann 1997, Kearnes et al. 1998, Scheper et al. 2014, Gill and Raine 2014, Godfray et al. 2014).

## **IUCN Threat 11. Climate change & severe weather**

### *Threat 11.2 Droughts*

Natural cycles of drought alter hydrology and have the potential to affect local sites of Western Blue Flag. The species' may be most susceptible to early season drought as the most active period of growth occurs during the high moisture conditions in the spring (COSEWIC 2010). Leaves die back during periods of drought and Western Blue Flag seems to adapt to fluctuations in precipitation presumably by the fluctuation in flowering stems produced between years (COSEWIC 2010). During prolonged periods of drought, changes in the temperature of surface soil layers may be more of a concern than lack of moisture as Western Blue Flag requires cool, moist soils (COSEWIC 2010). A decrease in the number of stems was observed at one population during a prolonged drought in 2000–2001 (CWBFMRT 2002), however the full extent and severity of this threat is unknown.

### *Threat 11.4 Storms & flooding*

Natural cycles of flooding alter hydrology and have the potential to affect local sites of Western Blue Flag. A high water table and flooding of a nearby lake has caused inundation of habitat at one population (CWBFMRT 2002). Western Blue Flag cannot tolerate permanently saturated soil and inundation for prolonged periods may alter hydrology enough to make the habitat unsuitable or affect the plant's ability to recover once soil has dried out (COSEWIC 2010).

## 5. Management Objective

The provincial *Maintenance and Recovery Plan for Western Blue Flag in Canada* contains the following management goal for the Western Blue Flag (Section 2.2, CWBFMRT 2002):

- To develop, communicate and encourage management to ensure long-term maintenance of all naturally occurring populations of Western Blue Flag in Canada.

Consistent with the goal set out in the provincial maintenance and recovery plan, this management plan establishes the following management objective for the Western Blue Flag in Canada:

- To ensure long-term maintenance of all extant native populations in Canada including any newly located or rediscovered native populations.

It is not possible to set a quantitative population objective at this time. Although a monitoring plan was set up in 2002 for some of the populations (ASRD and ACA 2005), they were only monitored for five years with the last monitoring work done in 2009. One of the objectives listed in the AB Maintenance/Recovery Plan (2002) was to “identify approximate minimum and maximum population objectives as +/- 20% of current stem numbers for each naturally-occurring western blue flag site”. Since stem numbers can fluctuate considerably from year to year (ASRD and ACA 2005), a longer term dataset is necessary for determining trends or average population size to take into account standard error and range of natural variation, and ensure this doesn’t exceed the 20% objective. In addition, since in any given year, some populations may have a low stem count or exceptionally high stem count, using a longer term average rather than “current” stem numbers would be a more reasonable estimate of whether the population was being maintained. Actions to move towards being able to set this more specific management objective are outlined in the conservation measures (Section 6.3).

## 6. Broad Strategies and Conservation Measures

### 6.1. Actions Already Completed or Currently Underway

#### Alberta

- The Canada Western Blue Flag Maintenance/Recovery Team was established in 2002 and completed the Western Blue Flag Maintenance and Recovery Plan (CWBFMRT 2002). The Western Blue Flag Conservation Program was established in 2002 by the Alberta Conservation Association to deliver the monitoring and stewardship actions identified in the plan.
- Starting in 2003, stewardship agreements and management plans were completed for all populations, with the exception of one, under the MULTISAR

project (previously The Western Blue Flag Conservation Program). Each management plan contains range management plans, stocking rates, in/out dates for cattle, water management plans, etc., consistent with Western Blue Flag requirements. A monitoring process to evaluate the success of range management plans in achieving the desired objectives was also developed. Participating properties were surveyed in 2005 and 2009.

- Complete inventories of two populations were carried out in 2002 and again in 2003 by ASRD and inventories of all naturally occurring populations were completed in 2004 and 2009 by ASRD.
- One or more monitoring plots were set up within 12 sites (now seven element occurrences<sup>10</sup>) and inventoried in 2002, 2003, 2004, 2005 and 2009 by Alberta Sustainable Resource Development.
- In 2003, research on the genetic diversity of Western Blue Flag populations in southern Alberta and northern Montana through DNA analysis was completed by the University of Alberta (McPherson 2003).
- Information on Western Blue Flag is included in the *Alberta's Threatened Wildlife* brochure series and rare plant fact sheets, as well as in publications at Police Outpost Provincial Park, Alberta.

## 6.2. Broad Strategies

In order to achieve the management objective, conservation measures are organized under four broad strategies:

- Inventory and monitoring
- Research as part of an adaptive management framework
- Communication, collaboration and engagement
- Habitat assessment, management and conservation

Many of the conservation measures in Table 3 are taken from the specific objectives of the Western Blue Flag Recovery Program, as listed in the Western Blue Flag Maintenance and Recovery Plan (2002).

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<sup>10</sup> According to ASRD and ACA (2005), one or more monitoring plots were set up within 12 "sites", some of which have now been amalgamated into the same element occurrence (now known as EO\_ID 12499, 12492, 12482, 22857, 12484, 12498, 12488).

### 6.3. Conservation Measures

**Table 3. Conservation Measures and Implementation Schedule**

Conservation Measures	Priority <sup>a</sup>	Threats <sup>b</sup> or Concern Addressed	Timeline
<b>Broad Strategy: Inventory and monitoring</b>			
Using consistent monitoring guidelines, continue monitoring program throughout the known range examining population and habitat trends.	High	Measure progress towards attaining the management objective	Ongoing
Apply 7-10 years of inventory and monitoring findings to identify average stem counts for each population or monitoring plot and determine range of natural variation and standard error. Determine if setting population management objective as +/- 20% of average stem numbers for each naturally-occurring Western Blue Flag population is reasonable.	Medium	Measure progress towards attaining the management objective	2024-2027
Using consistent survey guidelines, continue surveying new suitable habitat and historic locations throughout the known range.	Low	Measure progress towards attaining the management objective	Ongoing
Conduct genetic work to determine if the populations of unknown origin are introduced or native.	Low	Measure progress towards attaining the management objective.	2022
<b>Broad Strategy: Research as part of an adaptive management framework</b>			
Conduct research to develop a better understanding of the species ecology and needs (e.g., seed bank viability, recruitment and survival, pollination biology, genetic exchange)	Low	Knowledge gaps	2017-2022
Conduct research on anticipated climate change effects within the Foothills Grassland Natural Region of Alberta.	Low	11.2, 11.4	2017-2022
Conduct research on threat impacts (e.g. fire or fire suppression, grazing, invasive species control, changes in hydrology, threshold levels) and management practices on populations and habitat quality.	Medium	2.3, 5.2, 6.3, 7.1, 7.2, 7.3, 8.1, 8.2, 8.3, 9.1, 9.3	2017 - 2022
Apply research findings to amend, or develop new, range/habitat plans	Medium	2.1, 2.3, 6.3, 7.1, 7.2, 7.3, 8.1,	Ongoing

for each landowner with Western Blue Flag plants and encourage implementation of specific recommendations to maintain Western Blue Flag habitat.		8.2, 8.3, 9.1, 9.3	
Investigate effectiveness of specific landowner range/habitat plans, and adjust or adapt as needed to benefit the species.	Low	2.1, 2.3, 6.3, 7.1, 7.2, 7.3, 8.1, 8.2, 8.3, 9.1, 9.3	Ongoing
<b>Broad Strategy: Communication, Collaboration and Engagement</b>			
Provide information to the Alberta Endangered Species Conservation Committee to allow for an update of species management status.	Low	Measure progress towards attaining the management objective	Ongoing
Develop, communicate and encourage general principles for grazing management of Western Blue Flag Habitat	High	2.3, 7.3, 8.1, 8.2	Ongoing
Provide education on management of this species and other species at risk.	Low	All threats	Ongoing
<b>Broad Strategy: Habitat Assessment, Management and Conservation</b>			
Identify and initiate appropriate management activities for Western Blue Flag habitat.	High	All threats except 5.2, 11.2, 11.4	Ongoing
Identify, and act upon, any government policy changes that may be necessary for long-term sustainability of Western Blue Flag.	Low	All threats except 11.2, 11.4	N/A
Recommend effective criteria for regulations that conserve Western Blue Flag habitat and respect private landowners and lessees rights, such as engaging landowners/land managers through conservation or stewardship agreements.	Medium	All threats except 11.2 and 11.4	2017 onwards
Engage landowners/land managers in making various improvements that enable them to manage their land in a manner which sustains Western Blue Flag and creates opportunities for implementing conservation measures.	Medium	All threats except 5.2, 11.2, 11.4	Ongoing

<sup>a</sup> "Priority" reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the conservation of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the management objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the management objectives, but are still important for management of the population. Low priority conservation measures will likely have an indirect or gradual influence on reaching the management objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

<sup>b</sup> Threat numbers refer to the IUCN-CMP classification (see Table 2 for full threat names).

## **6.4. Narrative to Support Conservation Measures and Implementation Schedule**

### **Broad Strategy: Inventory and monitoring**

Since habitat degradation caused from various sources (Table 2) continues to be a threat to Western Blue Flag populations, and populations can fluctuate among years, continued inventory and monitoring of Western Blue Flag populations using the protocols that have already been established is important. The Western Blue Flag Maintenance and Recovery Plan recommends that monitoring of Western Blue Flag populations occur every five years or more frequently where decreasing trends in population size are noticed. However, to be able to establish a specific population management objective in the future, collecting population data for a few more years to determine a reliable average and error estimate is needed. Populations have not been re-visited in the last seven years and it is unknown how localized threats and/or weather patterns (e.g. drought or flooding) are currently affecting population numbers and habitat quality. Additionally, data surrounding population dynamics, habitat trends/conditions, and the extent and severity of many threats is lacking. Ongoing monitoring to measure and monitor these variables to obtain data useful for establishing a quantitative management objective, measuring progress towards attaining the current management objective, and making informed management recommendations that minimize risks to the species and meet the needs of decision makers and land users is needed.

### **Broad Strategy: Research as part of an adaptive management framework**

Knowledge gaps, limiting factors and threats identified for Western Blue Flag may be addressed through research and adaptive habitat management. Knowledge on aspects of species ecology and habitat, such as pollination biology, seed bank dynamics, and genetics, may help determine the adaptability of this species to future climate change or habitat restoration. Research on threat impacts will result in more targeted range/habitat plans and mitigation recommendations for agricultural, livestock farming and ranching, and industrial sectors impacting habitat of Western Blue Flag. For range/habitat plans already implemented, an adaptive approach should be applied through monitoring of the populations and habitat, evaluating the management actions, and making changes where needed to benefit the species and habitat.

### **Broad Strategy: Communication, collaboration and engagement**

Habitat degradation from overgrazing, trampling, and pugging/hummocking which can alter drainage patterns and hydrology is the most prevalent threat to Western Blue Flag. Continuing education and awareness of grazing management of Western Blue Flag habitat is a high priority since the majority of extant Western Blue Flag populations are located on private lands. Addressing any concerns to implementing beneficial grazing management is recommended through various communications, including site visits to develop or amend range/habitat plans for each landowner with Western Blue Flag

plants. Range/habitat plans and other conservation measures should be implemented after concerns have been addressed.

**Broad Strategy: Habitat assessment, management and conservation**

Conservation of habitat containing Western Blue Flag through voluntary measures like stewardship agreements, range/habitat plans and beneficial grazing management will be key to reducing threats. To date, MULTISAR has been successful in conserving the majority of privately owned sites through voluntary stewardship initiatives and an additional privately owned site is protected by a Conservation Easement with Nature Conservancy of Canada. Continuation of the relationship with the landowners will be important for conservation of this species since the majority of Western Blue Flag populations occur on privately owned lands.

## **7. Measuring Progress**

The performance indicators presented below provide a way to measure progress towards achieving the management objectives and monitoring the implementation of the management plan.

- All extant native populations of Western Blue Flag in Canada are being maintained by 2022.



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## Appendix A: Summary of Western Blue Flag Populations in Canada

**Table A1.** Summary of Western Blue Flag Populations in Canada. Dark grey shading indicates that the population is extirpated or historic. Light grey shading indicates that the population origins are unknown or introduced. ASRD/ACA Subpopulations are as defined in 2005, COSEWIC Sites are as defined in 2010, and Population Names are as defined in 2015. Further explanation follows in the footnotes.

ASRD and ACA Subpopulation [EO#] <sup>3</sup>	COSEWIC Site [EO#] <sup>2</sup>	Population Name [EO_ID] <sup>1</sup>	First Observed	Last Observed	Recent Survey Estimate [Year]	Highest Estimate [Year]	Current Status	Source of Plants	Threats
<b>Alberta</b>									
Basin South, Central and North [22] <sup>4</sup>	Basin South, Central and North [22] <sup>4</sup>	Basin [12499]	2002	2009	60345 Stems [2009]	60345 Stems [2009]	Extant	Native	2.3; 8.1; 9.1
Boundary, POPP East and West [04] <sup>5</sup>	Boundary, POPP East and West [04] <sup>5</sup>	Outpost Lake [12492]	2001	2009	3211 Stems [2009]	4996 Stems [2001]	Extant	Native	8.1; 8.2; 2.3; 7.1
Boundary, POPP East and West [04]	Boundary, POPP East and West [04]	Police Outpost Provincial Park [12482] <sup>10</sup>	1974	2010	547 Stems [2010]	829 Stems [2003], 325 Plants [1998]	Extant	Native	8.1; 7.3; 11.4
Carway North A [02] <sup>7</sup> and Carway North B, East and South [08] <sup>7</sup>	Carway North A [02] <sup>7</sup> and Carway North B, East and South [08] <sup>7</sup>	Carway [22857] <sup>11</sup>	1964	2009	1913 Stems [2009]	6619 Stems [2000]	Extant	Native	8.1; 7.1; 9.3; 2.3; 6.3
Whiskey Gap [01]	Whiskey Gap [01]	Whiskey Gap [12479] <sup>8</sup>	1964	2009	127 Stems [2009]	233 Stems [2002]	Extant	Native	2.1; 2.3, 8.1, 11.2
Northeast of Whiskey Gap [05]	Northeast of Whiskey Gap [05]	Whiskey Gap [12483]	1992	1999	>286 Plants [1999]	>286 Plants [1999]	Extant	Native	8.1

<b>ASRD and ACA Subpopulation [EO#]<sup>3</sup></b>	<b>COSEWIC Site [EO#]<sup>2</sup></b>	<b>Population Name [EO_ID]<sup>1</sup></b>	<b>First Observed</b>	<b>Last Observed</b>	<b>Recent Survey Estimate [Year]</b>	<b>Highest Estimate [Year]</b>	<b>Current Status</b>	<b>Source of Plants</b>	<b>Threats</b>
Harrisville West and East [06]	Harrisville West and East [06]	Ockey Ridge [12484] <sup>11</sup>	1989	2009	1256 Stems [2009]	6049 Stems [2000]	Extant	Native	6.3; 8.1; 8.2; 7.1
Not mentioned	Boundary School [26]	Boundary School [18746]	2005	2009	2365 Stems [2009]	2365 Stems [2009]	Extant	Native	8.1, 8.2; 7.1
Carway Customs [20]	Carway Customs [20]	Carway [12498]	2002	2009	148 Stems [2009]	726 Stems [2002]	Extant	Native	2.3; 8.1
Basin South, Central and North [22]	Basin South, Central and North [22]	Basin [12500]	2002	2009	1997 Stems [2009]	29487 Stems [2002]	Extant	Native	2.3; 8.1
Calgary International Airport [10]	Calgary Airport [10]	Calgary International Airport [12488] <sup>13</sup>	1997	2009	3299 Stems [2009]	3774 Stems [2003]	Extant	Unknown	8.1
Banff National Park [11]	Banff National Park [11]	Banff National Park [12489] <sup>14</sup>	1996	2016	1117 Stems [2009, 2016]	7774 Stems [2004]	Extant	Unknown	6.3, 7.1, 8.1
Fort MacLeod [no EO#]	Fort MacLeod [24]	Fort MacLeod [15453] <sup>13</sup>	2004	2009	72 Stems [2009]	101 Stems [2004]	Extant	Unknown	8.1, 8.2; 7.1
Park Lake [no EO#]	Park Lake [25]	Park Lake [15454] <sup>13,16</sup>	1993	2011	362 Stems [2010]	362 Stems [2010]	Extant	Unknown	8.1; 8.2; 7.1
Frank Lake [12]	Frank Lake [12]	Frank Lake [12490] <sup>15</sup>	1995	1995	Unknown	Unknown	Extant	Introduced	8.1
Mary Lake [07]	Mary Lake [07]	Mary Lake [12485] <sup>12</sup>	1989	1989	0 Stems [2000]	4 Stems [1989]	Historic	Native	None Recorded

ASRD and ACA Subpopulation [EO#] <sup>3</sup>	COSEWIC Site [EO#] <sup>2</sup>	Population Name [EO_ID] <sup>1</sup>	First Observed	Last Observed	Recent Survey Estimate [Year]	Highest Estimate [Year]	Current Status	Source of Plants	Threats
Picture Butte [03]	Picture Butte [03]	Picture Butte [12481] <sup>9</sup>	1978	1979	Unknown	Unknown	Extirpated	Introduced	None Recorded
University of Calgary [09]	University of Calgary [09] <sup>6</sup>	University of Calgary [unknown] <sup>9</sup>	Unknown	1993	small number of Stems [1993]	small number of Stems [1993]	Extirpated	Introduced	6.3

<sup>1</sup> EO\_ID refers to the element occurrence identification number, as assigned by the Alberta Conservation Information Management System (ACIMS) to indicate a distinct element occurrence based on NatureServe's habitat-based plant element occurrence delimitation guidance (NatureServe 2015c). For the purposes of this management plan, we are considering an element occurrence to be analogous to a population. It should be recognized that where we use the term "population", past reports have used the term "site" (COSEWIC 2010) or "subpopulation" (ASRD and ACA 2005). Populations and values in the table are those known to Environment and Climate Change Canada as of September 2015 and were obtained from the ACIMS.

<sup>2</sup> EO# refers to the element occurrence number, as assigned by the ACIMS and corresponds to the EO\_ID. In the most recent COSEWIC status report (2010), element occurrence numbers are considered to be analogous to a Site (COSEWIC 2010). The EO# and COSEWIC Sites in this table are those that appear in Appendix 1 of COSEWIC (2010).

<sup>3</sup> EO# refers to the element occurrence number, as assigned by the ACIMS and corresponds to the EO\_ID. In the ASRD and ACA update status report (2005), element occurrence numbers are considered to be analogous to a Subpopulation (ASRD and ACA 2005). The EO# and ASRD/ACA Subpopulations in this table are those that appear in Table 1 of ASRD and ACA (2005).

<sup>4</sup> As of 2015, the delineation of EO# 22 by the ACIMS as per the NatureServe habitat-based plant element occurrence delimitation guidance, was updated. As a result, EO# 22 was split into two distinct element occurrences (EO#21: EO\_ID 12499 and EO#22: EO\_ID 12500) and will now be considered as two distinct populations.

<sup>5</sup> As of 2015, the delineation of EO# 04 by the ACIMS as per the NatureServe habitat-based plant element occurrence delimitation guidance, was updated. As a result, EO# 04 was split in to two distinct element occurrences (EO#04: EO\_ID 12482 and EO#14: EO\_ID 12492) and will now be considered as two distinct populations.

<sup>6</sup> This EO# is not in the 2015 ACIMS database.

<sup>7</sup> As of 2015, the delineation of EO# 02 and 08 by the ACIMS as per the NatureServe habitat-based plant element occurrence delimitation guidance, was updated. As a result, EO# 02 and EO# 08 were amalgamated in to one distinct element occurrence (EO#27: EO\_ID 22857) and will now be considered as one distinct population.

<sup>8</sup> This population has 1 historic and 1 extirpated occurrence which are not being included as part of the management objectives at this time.

<sup>9</sup> The entire population is considered introduced and extirpated and is not being included as part of the management objectives at this time.

<sup>10</sup> This population has 2 inaccurate occurrences which are not being included as part of the management objectives at this time.

<sup>11</sup> This population has 1 historic occurrence which is not being included as part of the management objectives at this time.

<sup>12</sup> The entire population is considered historic and is not being included as part of the management objectives at this time. This population may be extirpated, but extirpation has not been confirmed.

<sup>13</sup> This population is of unknown origins and likely is introduced; it is not being included as part of the management objectives at this time.

<sup>14</sup> The origin of the population is unknown and its occurrence within the native range of the species is questionable (COSEWIC 2010). Therefore, this population is not being included as part of the management objectives at this time. However, since this population resides within Banff National Park, it is protected under Canada's *National Parks Act*.

<sup>15</sup> The origin of this population is unknown, although likely introduced, and occurs with cultivated irises; it is not being included as part of the management objectives at this time. This population may be extirpated, but extirpation has not been confirmed.

<sup>16</sup> This population was thought to be extirpated, but it has since been confirmed as extant.



## Appendix B: 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\*](#)<sup>11</sup>. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [\*Federal Sustainable Development Strategy\*](#)'s<sup>12</sup> (FSDS) goals and targets.

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

The most significant effect that the conservation of Western Blue Flag will have on other species will be the decline in or reversal of habitat degradation. Several other plant and animal species may use similar habitat as Western Blue Flag for some part of their life cycle or daily activities. In terms of use by species listed under the federal *Species at Risk Act*, the following species' ranges overlap with the range of Western Blue Flag in Canada: Olive-sided Flycatcher (*Contopus cooperi*), Chestnut-collared Longspur (*Calcarius ornatus*), Common Nighthawk (*Chordeiles minor*), Ferruginous Hawk (*Buteo regalis*), Sprague's Pipit (*Anthus spragueii*), Rusty Blackbird (*Euphagus carolinus*), Yellow Rail (*Coturnicops noveboracensis*), Short-eared Owl (*Asio flammeus*), McCown's Longspur (*Rhynchophanes mccownii*), Loggerhead Shrike (*Lanius ludovicianus*), Long-billed Curlew (*Numenius americanus*), Peregrine Falcon (*Falco peregrinus*), Wolverine (*Gulo gulo*), Western Toad (*Anaxyrus boreas*), Monarch (*Danaus plexippus*), and Western Painted Turtle intermountain – rocky mountain population (*Chrysemys picta belli*). Therefore, it is likely the conservation of habitat for Western Blue Flag will benefit other species where they co-occur.

Any management activities, conservation measures or range/habitat plans should strive to benefit as many species as possible, and the ecological risks of any action must be considered before undertaking them to reduce any potential negative effects on other species and their habitats. Efforts should be coordinated with other recovery teams and organizations working in prairie habitat surrounding Western Blue Flag populations. This will ensure the most efficient use of resources, prevent duplication of effort, conflicts with research, and minimize negative impacts to species at risk.

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<sup>11</sup> [www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1](http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1)

<sup>12</sup> [www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1](http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1)