COSEWIC
Status Appraisal Summary

on the

Karner Blue
Plebejus samuelis

in Canada

EXTIRPATED
2019

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status appraisal summaries are working documents used in assigning the status of wildlife species suspected of being at risk in Canada. This document may be cited as follows:

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COSEWIC
Assessment Summary

Assessment Summary – May 2019

Common name
Karner Blue

Scientific name
Plebejus samuelis

Status
Extirpated

Reason for designation
This butterfly occurred within a restricted range in oak savannah and woodland habitats in southern Ontario. Its population decline and degradation of its habitat are well documented. The species has not been seen since 1991 despite ongoing search efforts.

Occurrence
Ontario

Status history
Has not been observed since 1991. Designated Extirpated in April 1997. Status re-examined and confirmed in May 2000, April 2010, and May 2019.

COSEWIC
Status Appraisal Summary

Karner Blue

Bleu mélissa

Plebejus samuelis

Range of occurrence in Canada: Ontario

COSEWIC Status History
Has not been observed since 1991. Designated Extirpated in April 1997. Status re-examined and confirmed in May 2000, April 2010, and May 2019.

Wildlife species:

Change in eligibility, taxonomy or designatable units: yes ☒ no ☐

Explanation:
The taxonomy of Karner Blue has changed; previously it was assessed as *Lycaeides melissa* Edwards, subspecies *samuelis* Nabokov (COSEWIC 2000, 2010). Earlier molecular research (Packer et al 1998; Gompert *et al.* 2006, 2008) showed evidence supporting that it is a subspecies of Melissa Blue, and the first two COSEWIC (2000, 2010) status assessments reflected this classification. Since then, it has been placed in the genus *Plebejus* Kluk, subgenus *Lycaeides* Hübner (Opler and Warren 2002; Pehlam 2008; Pohl *et al.* 2018), and more importantly is now considered a valid species, *P. samuelis* (Nabokov), separate from Melissa Blue (*P. melissa* Edwards) (Pohl *et al*. 2018). This placement is warranted based on the recent work of Forister *et al*. (2011) who provided population genetic evidence that suggested it was more appropriate to consider Karner Blue a valid species. In addition to the population genetic differences (Forister *et al*. 2011), morphological differences (Lane and Weller 1994; Lucas *et al*. 2008; Forister *et al*. 2011), and geographic separation of Karner Blue (ON) from Melissa Blue (MB-BC) (Layberry *et al*. 1998), Karner Blue is believed to feed only on *Lupinus perennis*. Melissa Blue likely uses other Fabaceae in addition to lupine (Layberry *et al*. 1998). This updated COSEWIC status appraisal summary follows the taxonomy of Pohl *et al*. (2018) and considers Karner Blue a valid species, *Plebejus samuelis* (Nabokov).

Range:

Change in Extent of Occurrence (EOO):	yes ☐ no ☒ unk ☐
Change in Index of Area of Occupancy (IAO):	yes ☐ no ☒ unk ☐
Change in number of known or inferred current locations[1]:	yes ☐ no ☒ unk ☐
Significant new survey information	yes ☒ no ☐

1 The term 'location' defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat. Where the most serious plausible threat does not affect all of the taxon's distribution, other threats can be used to define and count locations in those areas not affected by the most serious plausible threat. (Source: IUCN 2010, 2011). In the absence of any plausible threat for the taxon, the term "location" cannot be used and the sub-criteria that refer to the number of locations will not be met. (Source: IUCN 2010, 2011).

Explanation:
Remnant oak woodland and savanna habitats where Wild Lupine is present have been well surveyed for butterflies over the past ten years (Linton pers. com. 2018; Otis pers. comm. 2018; Jones pers. comm. 2019), and there are long-term butterfly lists from most of the known historical Karner Blue butterfly habitats (Macnaughton *et al*. 2019). There have also been ongoing studies to assess the habitat as part of the feasibility of reintroduction (Otis 2017; Otis pers. comm. 2018). Despite extensive search effort in these and other remnant habitats with Wild Lupine, Karner Blue has not been reported in the province since 1991 at St. Williams (COSEWIC 2000; Environment and Climate Change Canada 2017; Linton pers. comm. 2018; Jones pers. comm. 2019; Macnaughton *et al*. 2019).

Population Information:

Change in number of mature individuals:	yes ☐ no ☒ unk ☐
Change in population trend:	yes ☐ no ☒ unk ☐
Change in severity of population fragmentation:	yes ☐ no ☒ unk ☐
Change in trend in area and/or quality of habitat:	yes ☒ no ☐ unk ☐
Significant new survey information	yes ☐ no ☒

Explanation:
Karner Blue butterfly is extirpated from Canada, and there is no new information about the historical number of mature individuals at known subpopulations, overall Canadian population trend or severity of population fragmentation. Prior to its extirpation from Canada, subpopulation estimates were completed for the Port Franks/Pinery Provincial Park habitats (Hess 1981; Crabe 1984; Schweitzer 1985). In 1980, this subpopulation was estimated at 200–300 individuals during the first brood (Hess 1981); in 1983, it was estimated at 200 individuals (Crabe 1984). The most reliable estimate was calculated from a mark-release-recapture study completed in 1984 and the subpopulation was estimated at 1,000 individuals during the second brood (Schweitzer 1985; Packer 1990). After this date, Karner Blue observations declined significantly at the Port Franks/Pinery Provincial Park subpopulation (Packer 1987, 1990). At the time, the Karner Blue Sanctuary at Port Franks supported the largest portion of this subpopulation, with smaller habitat patches that supported local subpopulations in Port Franks and Pinery Provincial Park. Records for the other subpopulations in Canada are limited to abundance counts during surveys (e.g., St. Williams Conservation Reserve, Toronto, London, and Sarnia) (COSEWIC 2000; Macnaughton *et* al. 2019). The species may have also occurred near Cobourg in the Rice Lake Plains area (Catling and Brownell 2000) but there are no specimens associated with this occurrence.

The extent and quality of habitat are inferred to have declined since the last sighting of Karner Blue in Canada in 1991. However, there has been a change in trend in area and/or quality of habitat available for Karner Blue since the last COSEWIC (2000, 2010) status assessments. In the last ten years, the health and extent of Wild Lupine and associated savanna habitat at some historical Karner Blue habitats have been improving due to management. For example, there have been controlled burns at Pinery Provincial Park and Alderville First Nation and restoration efforts by the Nature Conservancy of Canada in Norfolk and Lambton Counties. As a result, the Ontario Butterfly Recovery and Implementation Team is beginning to discuss the possibility of Karner Blue reintroduction (Linton pers. comm. 2018; Jones pers. comm. 2019).

Threats:

Change in nature and/or severity of threats: yes ☐ no ☒ unk ☐

Explanation:
A formal threats assessment and classification (see CMP 2010) was not completed because there are no extant subpopulations of Karner Blue in Canada. However, existing and future threats were examined and discussed in the federal recovery strategy that includes Karner Blue (Environment and Climate Change Canada 2019). 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 (i.e., Karner Blue) in the area of interest (i.e., historical Karner Blue habitats in southern Ontario) (Salafsky *et al*. 2008). Threats are assessed under the International Union for the Conservation of Nature-Conservation Measures Partnership (IUCN-CMP) threat categories 1–11, and these threats are summarized below (for full text see Environment and Climate Change Canada 2017).

Present-day potential threats to the habitat include recreational activities (Threat 6.1) that damage host and nectar plants, directly kill feeding larvae, and facilitate the spread of non-native plants. Recreational activities include hiking, dog-walking and bike-riding, and occur throughout Pinery Provincial Park, St. Williams Conservation Reserve, Karner Blue Sanctuary and other Wild Lupine sites (Environment and Climate Change Canada 2017). Additional proximal threats are considered other ecosystem modifications (Threat 9.3) in the IUCN-CMP threats classification system and refer to those threats that indirectly impact Karner Blue individuals and habitat. These threats include the spread of invasive non-native/alien plants (Threat 8.1) that out-compete Wild Lupine. Such highly competitive plants in Karner Blue habitats include Orange Hawkweed (*Pilosella aurantiaca*), Leafy Spurge (*Euphorbia esula*), Crown Vetch (*Securigera varia*), White Sweet Clover (*Melilotus albus*) and Spotted Knapweed (*Centaurea stoebe*) (USFWS 2012; Jarvis 2014). Autumn-olive (*Elaeagnus umbellata*) and Multiflora Rose (*Rosa multiflora*) are also present at the St. Williams Conservation Reserve.

Karner Blue maintains a facultative mutualistic relationship with various ant species (Savignano 1994; Pascale and Thiet 2016). The non-native European Fire Ant (*Myrmica rubra*) is now known to occur at some of the same sites as historical Karner Blue subpopulations (Jarvis 2014) and is a likely predator on the ant species that tend Karner Blue larvae, as well as butterfly larvae and other arthropods within the home range of this invasive ant's nest. Native White-tailed Deer (*Odocoileus virginianus*) can also impact Karner Blue and its habitat by over-browsing on Wild Lupine and other nectar plants (Threat 7.3) as well as by directly consuming feeding larvae (Threat 8.2). Pesticide drift from adjacent landowners (Threat 9.3) can impact Karner Blue reintroduction sites. However, lands where pesticide is likely to be applied are greater than 500 metres from Karner Blue habitat, so this is not considered a high impact threat. In the longer term and if Karner Blue were to be reintroduced, climate change from habitat shifting and alteration (Threat 11.1), droughts (11.2) and temperature extremes (Threat 11.3) could all threaten Karner Blue subpopulation persistence, life cycle and emergence, host plant senescence and habitat suitability, although the severity and timing are unknown (Environment and Climate Change Canada 2017).

Historical threats to Karner Blue are predominantly habitat loss from land conversion for residential/ commercial development (Threat 1.1 and 1.2) and agriculture (Threat 2.1). Sandy oak savanna, woodland and tallgrass prairie habitats in Ontario prior to European settlement are estimated to be 80,000–200,000 ha (Taylor *et al*. 2014). Today approximately 1% of those habitats remain (Taylor *et al*. 2014). Karner Blue would have occurred in the savanna portion of these habitats, an even smaller proportion than is estimated.

Since European settlement, fire suppression (Threat 7.1) and the lack of the natural disturbance processes (e.g., wildfire) have further contributed to the decline of Wild Lupine. If Karner Blue were to be reintroduced to Canada, this threat would still be applicable without ongoing habitat management. Additional historical threats include widespread insecticide spray programs to control the spread of non-native European Gypsy Moth (*Lymantria dispar dispar*) within the same habitats as Karner Blue (Threat 9.3). Pesticides applied to Gypsy Moth are harmful to all Lepidoptera larvae. The provincial Gypsy Moth control program is no longer active; however, regional treatments within municipalities and/or on private properties are a potential threat should the Karner Blue be reintroduced (Environment and Climate Change Canada 2017). Excessive collecting (Threat 5.1) is a historical threat although specimen collecting is still a threat to rare butterflies in Ontario and a possible threat if Karner Blue were to be reintroduced (COSEWIC 2006; Environment and Climate Change Canada 2017).

Protection:

Change in effective protection: yes ☒ no ☐ unk ☐

Explanation:
Federal protection: Karner Blue is listed as Extirpated under Schedule 1 of the federal *Species at Risk Act* (SARA). This species is one of three butterflies included in the federal multi-species recovery strategy for the Karner Blue, Frosted Elfin (*Callphrys irus*) and Eastern Persius Duskywing (*Erynnis persius persius*) in Canada completed in 2017 (Environment and Climate Change Canada 2019). The recovery strategy sets out a schedule of studies (Section 7.2) of when and how critical habitat would be identified if recovery is deemed feasible or the species is reintroduced in Canada (Environment and Climate Change Canada 2019).

Provincial (Ontario) protection: Karner Blue was listed as Endangered in 1990, under Ontario's previous *Endangered Species Act* [ESA](1971), and in 2007, when this act was revised (ESA 2007). Under this provincial act, endangered species receive protection for both the individuals and their habitat. Although initially listed as endangered, no habitat was protected because there were no extant sites in Canada. In 2009, Karner Blue was reassessed and its status changed from endangered to extirpated. An extirpated species receives species protection but not habitat protection, unless a habitat regulation is prescribed. No habitat regulation is prescribed for Karner Blue.

Under the Ontario ESA there are no requirements for recovery planning until such time as the province determines that reintroduction is feasible. Recovery feasibility for Karner Blue is discussed in the federal multi-species recovery strategy (see Environment and Climate Change Canada 2019). Karner Blue research in the United States has determined a minimum viable population size[2] at 3000 individuals during the second brood[3]. A population of this size requires 150 ha of suitable habitat (Environment and Climate Change Canada 2017). There have been numerous attempts to assess the availability and quality of suitable habitat for Karner Blue in Canada. This information has been gathered to scientifically inform the decisions around reintroduction to Canada (see Chan 2004; Chan and Packer 2006; Bernard *et al*. 2012; Jarvis 2014; Otis 2017). At present, no historical locations for Karner Blue have enough Wild Lupine to sustain a population. Recent restoration efforts, which have included Wild Lupine seeding and prescribed burning in Norfolk County, have increased the quantity and quality of habitat (Linton pers. comm. 2018; Otis pers. comm. 2018; Jones pers. comm. 2019).

The Toronto Zoo determined Karner Blue could be successfully reared in captivity for release in Ontario (Mason pers. comm. 2010 in COSEWIC 2010) and there is a detailed propagation handbook available which informs numerous captive rearing programs in the United States (Webb 2010). To date (January 2019) there is no decision to reintroduce Karner Blue to Canada although the Ontario Butterfly Species at Risk Recovery and Implementation Team is actively supporting those working on recovery actions including habitat restoration and research (Linton pers. comm. 2018; Otis pers. comm. 2018).

Other non-legal status ranks and protection:

Ontario subnational status: SX (extirpated) (NHIC 2018)
Canada General Status:NX (extirpated) (Natureserve 2018)
Global Status: G5T2 (Imperilled) (Natureserve 2018)
United States National Status: N2 (Imperilled) (Natureserve 2018)
United States Subnational Status: Illinois (S1), Indiana (S1), Iowa (SNR), Maine (SX), Massachusetts (SX), Michigan (S2), Minnesota (S1), New Hampshire (S1), New York (S1), Ohio (S1), Pennsylvania (SX), Wisconsin (S3) (Natureserve 2018)
United States Endangered Species Act: Listed Endangered (December 14, 1992).

Rescue Effect:

Change in evidence of rescue effect: yes ☐ no ☒

Explanation: Karner Blue Butterfly is endangered throughout its global range and remains within habitats

2 'an estimate of the number of individuals required for a high probability of survival of a population over a given period of time' (Environment and Climate Change Canada 2017).

3 'a brood is a generation of butterfly species. Two broods of Karner Blue butterflies hatch each year, one in the spring and one in the summer' (Environment and Climate Change Canada 2017).

that are isolated and widely separated from one another (USFWS 2012). The species requires Wild Lupine as its larval host plant, and adults are tightly associated with host plant patches (COSEWIC 2000). The species is not known to migrate, or to disperse distances much greater than 1.3 km when there is good habitat connectivity (Shillinglaw and Shillinglaw 2008 as read in USFWS 2012). It is extremely unlikely that the species could recolonize any of the historical localities in Ontario without human assistance (i.e., a captive breeding, habitat restoration and reintroduction program).

Quantitative Analysis:

Change in estimated probability of extirpation: yes ☐ no ☒ unk ☐

Details:
Karner Blue has not been recorded in Ontario since 1991 (COSEWIC 2000; Environment and Climate Change Canada 2017; Macnaughton *et al*. 2019). There was no quantitative analysis on the population of Karner Blue in the province prior to extirpation. There have been abundance counts of Wild Lupine at larger sites in the province, which can be used as a proxy for habitat suitability and the feasibility of reintroduction for Karner Blue (e.g., Chan and Packer 2006; Otis 2017). These studies were completed after Karner Blue was assessed Extirpated from Canada.

Summary and Additional Considerations [e.g., recovery efforts]:
In November 2017, the Ontario Butterfly Species at Risk Recovery and Implementation Team had their first meeting (Linton pers. comm. 2018) and numerous recovery team members work on many of the recovery actions for Karner Blue. The federal multi-species recovery strategy includes Karner Blue (Environment and Climate Change Canada 2019). There is extensive ongoing research and recovery work in the United States that contributes greatly to the overall biological understanding and recovery approaches for the species (for summary of recent information see Hess and Hess 2015 and USFWS 2012).

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WRITER OF SAS

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Table 1. Karner Blue subpopulations in Canada (see Macnaughton *et al.* 2019 for complete list of Karner Blue specimens and/or observation records in Canada).

County	First and most recent year recorded	Approximate number of specimens or observations	Name of historical habitat with Karner Blue subpopulation	Ongoing restoration to improve habitat for Karner Blue
Durham	1948	1	Uxbridge	
Lambton	1936 - 1990	> 1159	Port Franks/Pinery Provincial Park, Grand Bend	yes
Middlesex	year not recorded	2	London	no
Norfolk	1952 - 1991	62	St. Williams Conservation Preserve; Charlottesville (Township)	yes
Toronto	1884 - 1912	> 95	Toronto	no

TECHNICAL SUMMARY

Plebejus samuelis

Karner Blue

Bleu mélissa

Range of occurrence in Canada: Ontario

Demographic Information

Generation time	1 year
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Not applicable
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Not applicable
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Not applicable
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Not applicable
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Not applicable
Are the causes of the decline a. clearly reversible and b. understood, and c. ceased?	a. yes; b. yes c. no
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	Current EOO 0 Historical < 13,000 km^2
Index of area of occupancy (IAO) (2x2 grid value)	Current IAO 0 Historical IAO < 20km^2
Is the population “severely fragmented” i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. Not applicable b. Not applicable
Number of “locations”[4]	0
Is there an [observed, inferred, or projected] decline in extent of occurrence?	Not applicable

∗ See Definitions and Abbreviations on COSEWIC website and IUCN (Feb 2014) for more information on this term

Is there an [observed, inferred, or projected] decline in index of area of occupancy?	Not applicable
Is there an [observed, inferred, or projected] decline in number of subpopulations?	Not applicable
Is there an [observed, inferred, or projected] decline in number of “locations”*?	Not applicable
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Unknown, some historical habitats have active restoration while others have none
Are there extreme fluctuations in number of subpopulations?	Not applicable
Are there extreme fluctuations in number of “locations”?	Not applicable
Are there extreme fluctuations in extent of occurrence?	Not applicable
Are there extreme fluctuations in index of area of occupancy?	Not applicable

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	**N Mature Individuals**
Total	None

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations, or 10% within 100 years]?	Not calculated, no data

Threats (direct, from highest impact to least, as per IUCN Threats Calculator)

Was a threats calculator completed for this species? No; however, threats were assessed under IUCN-CMP threat categories as part of the federal multi-species recovery strategy that includes Karner Blue (see Environment and Climate Change Canada 2019). What additional limiting factors are relevant? Larvae depend on Wild Lupine to complete their life cycle; and the larvae are attended by numerous species of ants.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	SX – S2S4 in all jurisdictions where the species has been assessed, except Idaho (SNR). Listed Endangered under the United States *Endangered Species Act* (December 14, 1992).
Is immigration known or possible?	Not possible
Would immigrants be adapted to survive in Canada?	Yes

Is there sufficient habitat for immigrants in Canada?	Unknown
Are conditions deteriorating in Canada?+	Yes, at some historical habitats
Are conditions for the source (i.e., outside) population deteriorating?+	Yes
Is the Canadian population considered to be a sink?+	Not applicable
Is rescue from outside populations likely?	No

Data Sensitive Species

Is this a data sensitive species?	No

Status History

COSEWIC: Has not been observed since 1991. Designated Extirpated in April 1997. Status re-examined and confirmed in May 2000, April 2010, and May 2019.

Status and Reasons for Designation:

Status: Extirpated	**Alpha-numeric codes:** Not applicable
Reasons for designation: This butterfly occurred within a restricted range in oak savannah and woodland habitats in southern Ontario. Its population decline and degradation of its habitat are well documented. The species has not been seen since 1991 despite ongoing search efforts.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable
Criterion C (Small and Declining Number of Mature Individuals): Not applicable
Criterion D (Very Small or Restricted Population): Not applicable
Criterion E (Quantitative Analysis): Not applicable

+ See Table 3 (Guidelines for modifying status assessment based on rescue effect)

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2019)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

Environment and Climate Change Canada
Canadian Wildlife Service
Environnement et Changement climatique Canada
Service canadien de la faune
Canada

The Canadian Wildlife Service, Environment and Climate Change Canada, provides full administrative and financial support to the COSEWIC Secretariat.