COSEWIC
Status Appraisal Summary

on the

Prothonotary Warbler
Protonotaria citrea

in Canada

ENDANGERED
2016

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 – November 2016

Common name
Prothonotary Warbler

Scientific name
Protonotaria citrea

Status
Endangered

Reason for designation
In Canada, this species breeds only in deciduous forest swamps in the Carolinian region of southwestern Ontario. The population is small, fewer than 30 individuals, and at risk of decreasing further. This warbler is vulnerable to degradation of breeding habitat from wetland drainage, forest harvest, development, invasion of European Common Reed, and loss of tree canopy cover due to dieback caused by Emerald Ash Borer. Loss of mangrove wintering habitat to aquaculture and coastal development in Central and South America poses additional threats.

Occurrence
Ontario

Status history
Designated Special Concern in April 1984. Status re-examined and designated Endangered in April 1996. Status re-examined and confirmed in May 2000, April 2007, and November 2016.

COSEWIC
Status Appraisal Summary

Protonotaria citrea

Prothonotary Warbler

Paruline orangée

Range of occurrence in Canada: Ontario

Status History:

Designated Special Concern in April 1984. Status re-examined and designated Endangered in April 1996. Status re-examined and confirmed in May 2000, April 2007, and November 2016.

Wildlife species:

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

Explanation:

No new evidence is available to support a change.

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 locations1: yes ☐ no ☒ unk ☐

Significant new survey information yes ☐ no ☒

Explanation:

This species is very rare in Canada, but is actively monitored by a combination of amateurs and professionals. Many occupied sites are prone to blinking on and off. This level of annual fluctuation makes it difficult to ascertain whether there has been a true change in occupied range, but such a change seems unlikely. Fewer than 10 locations are occupied in Canada in any given year (e.g., no more than 8 in 2015).

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 ☐

[1] Use the IUCN definition of “location”

Explanation:

Numbers have remained stable or declined slightly in Canada since the previous status report, from 28-34 mature individuals (COSEWIC 2007) to 28 in 2015. As such, the population trend has changed from the steep decline reported in the previous status report. See Appendix A for details.

The North American population estimate has been adjusted slightly since the last status report. Based on new analysis techniques, the continental population is now estimated at about 1.6 million mature individuals (Blancher *et al.* 2012), versus an estimated 1.8 million birds in the previous COSEWIC report. However, this is mostly just a change in the manner in which estimates are derived.

Based on the Breeding Bird Survey (Sauer *et al.* 2014), the long-term North American trend was -1.1% per year from 1966-2013 (95% CI = -1.6 to -0.7). The short-term 10-year trend was -0.5% per year from 2003 to 2013 (95% CI = -1.7 to 0.7), which is equivalent to a decline of no more than 17% over the decade. Figure 1 depicts the North American population trend.

In Canada, there has been a major and ongoing deterioration in the quality and extent of breeding habitat in the last decade caused by invasive species, notably European Common Reed (*Phragmites australis* ssp. *australis*) and Emerald Ash Borer (*Agrilus planipennis*).

Threats:

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

Explanation:

The severity of threats imposed by invasive insects (especially Emerald Ash Borer) and invasive plants (especially European Common Reed) on the quality of habitat on the Canadian breeding grounds has increased dramatically since the last assessment. In addition, forest harvest has also been shown to negatively affect Prothonotary Warblers (e.g., Heltzel and Leberg 2010), and there has been an ongoing loss of wetlands in the US breeding range (e.g., Stedman and Dahl 2008).

Protection:

Change in effective protection: yes ☒ no ☐

Explanation:

A federal recovery strategy was published in 2011 (Environment Canada 2011). This included the identification of critical breeding habitat in Canada. Ontario adopted the federal recovery strategy in 2012 (OMNR 2012). However, the change in effective protection is minor, given that all critical habitat identified is within existing Conservation Areas, Provincial Parks, Areas of Natural and Scientific Interest, Environmentally Sensitive Areas, National Wildlife Areas, or Significant Natural Areas.

Rescue Effect:

Change in evidence of rescue effect: yes ☐ no ☒

Explanation:

The population in the US continues to decline (Sauer *et al*. 2014) and the limited available habitat in Canada is continuing to decline; see **Population Information** above.

Quantitative Analysis:

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

Details:

No new information.

Summary and Additional Considerations: [e.g., recovery efforts]

Recovery efforts in Canada have been underway since the late 1990s. A formal recovery strategy was published in 2011 (Environment Canada 2011). This was adopted by the province of Ontario in 2012. Recovery efforts have primarily focused on habitat creation and habitat enhancement, the latter through a nest box program. However, the intensity of recovery efforts has lessened substantially over the past decade, because the nest box program was shown to be successful at only a few sites that have few or no House Wrens (*Troglodytes aedon*). Most sites experienced such high rates of inter-specific competition with House Wrens for nest boxes that they exacerbated the decline of Prothonotary Warblers (McCracken 2008; McCracken and Vande Somple 2009). In addition, threats posed by the invasion of European Common Reed and other invasive plants such as European Black Alder (*Alnus glutinosa*) at many sites has greatly intensified over the past decade, have thus far proven impossible to manage, and are expected to continue to reduce habitat suitability for Prothonotary Warblers. Lastly, long-term climate change effects on water levels in swamp forests in Canada could be a major factor on habitat suitability.

Acknowledgements and authorities contacted:

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Information sources:

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Author of SAS: Jon McCracken, Prothonotary Warbler Recovery Team Co-chair

TECHNICAL SUMMARY

Protonotaria citrea

Prothonotary Warbler

Paruline orangée

Range of occurrence in Canada: Ontario

Demographic Information

Generation time (average age of parents in the population)	2-4 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Yes, a decline is projected based on deteriorating habitat quality.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[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. While the Canadian population of actual breeding pairs may have declined slightly over the past decade, the population is so small that calculation of a percent change is not appropriate.
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown percentage, but a decline is projected.
[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.	Unknown
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. No b. Yes c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	~ 11,500 km².
Index of area of occupancy (IAO) (Always report 2x2 grid value).	Maximum of 40 km², based on no more than 10 (2 km x 2 km) squares being occupied annually.
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. No b. No
Number of "locations"∗	<10 (locations that are occupied annually)

∗ 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 extent of occurrence?	Not likely, but some uncertainty due to annual fluctuation in occupied sites
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	Yes, projected decline based on invasive species threats.
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”*?	Yes, projected decline due to invasive plants and insects.
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Yes, observed and projected decline in area and quality of habitat due to invasive plants and insects.
Are there extreme fluctuations in number of subpopulations?	No
Are there extreme fluctuations in number of “locations?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	**N Mature Individuals**
Total	28 (including unmated adults)

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not calculated

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

Was a threats calculator completed for this species? No

i. Loss of swamp forest breeding habitat stemming from wetland drainage and development;

ii. Degradation of breeding habitat from effects of non-native invasive plants and insects results in loss of expanses of open water (e.g., due to invasion of European Common Reed) and loss of tree canopy cover (e.g., due to dieback from Emerald Ash Borer) that leads to increased competition with House Wrens;

iii. Degradation of breeding habitat from effects of forest harvest;

iv. Loss of mangrove forest wintering habitat in Central and South America owing to aquaculture (e.g., shrimp farming) and coastal development.

What additional limiting factors are relevant? This species has highly specialized, habitat requirements. It requires tree cavities located in mossy, deciduous swamp forests (especially mature forests) during the breeding season, while mangrove forests are highly favoured in winter. In addition, in at least some years, there have been inexplicably high rates of nest failure because of infertile eggs (McCracken and Vande Somple 2009).

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Population in the US has been showing small but sustained declines since 1968.
Is immigration known or possible?	Yes
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Are conditions deteriorating in Canada?+	Yes, primarily owing to deteriorating habitat quality and quantity because of invasive plants and insects.
Are conditions for the source population deteriorating?+	Yes
Is the Canadian population considered to be a sink?+	Unknown
Is rescue from outside populations likely?	No

Data Sensitive Species

Is this a data sensitive species? Yes (its nests are very popular with birders and photographers; precise site data should not be released).

Status History

Designated Special Concern in April 1984. Status re-examined and designated Endangered in April 1996. Status re- examined and confirmed in May 2000, April 2007, and November 2016.

Status and Reasons for Designation:

Status:	**Alpha-numeric codes:**
Endangered	C2a(i);D1
Reasons for designation: In Canada, this species breeds only in deciduous forest swamps in the Carolinian region of southwestern Ontario. The population is small, fewer than 30 individuals, and at risk of decreasing further. This warbler is vulnerable to degradation of breeding habitat from wetland drainage, forest harvest, development, invasion of European Common Reed, and loss of tree canopy cover due to dieback caused by Emerald Ash Borer. Loss of mangrove wintering habitat to aquaculture and coastal development in Central and South America poses additional threats.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable, as rate of decline has been small over the past 10 years.
Criterion B (Small Distribution Range and Decline or Fluctuation): Meets Threatened under B2ab(ii,iii), but not Endangered as there are likely more than 5 remaining locations.

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

Criterion C (Small and Declining Number of Mature Individuals): Meets Endangered under C2a(i), given a total population of <30 mature individuals and projected further declines.
Criterion D (Very Small or Restricted Population): Meets Endangered under D1, with <30 mature individuals.
Criterion E (Quantitative Analysis): Not conducted.

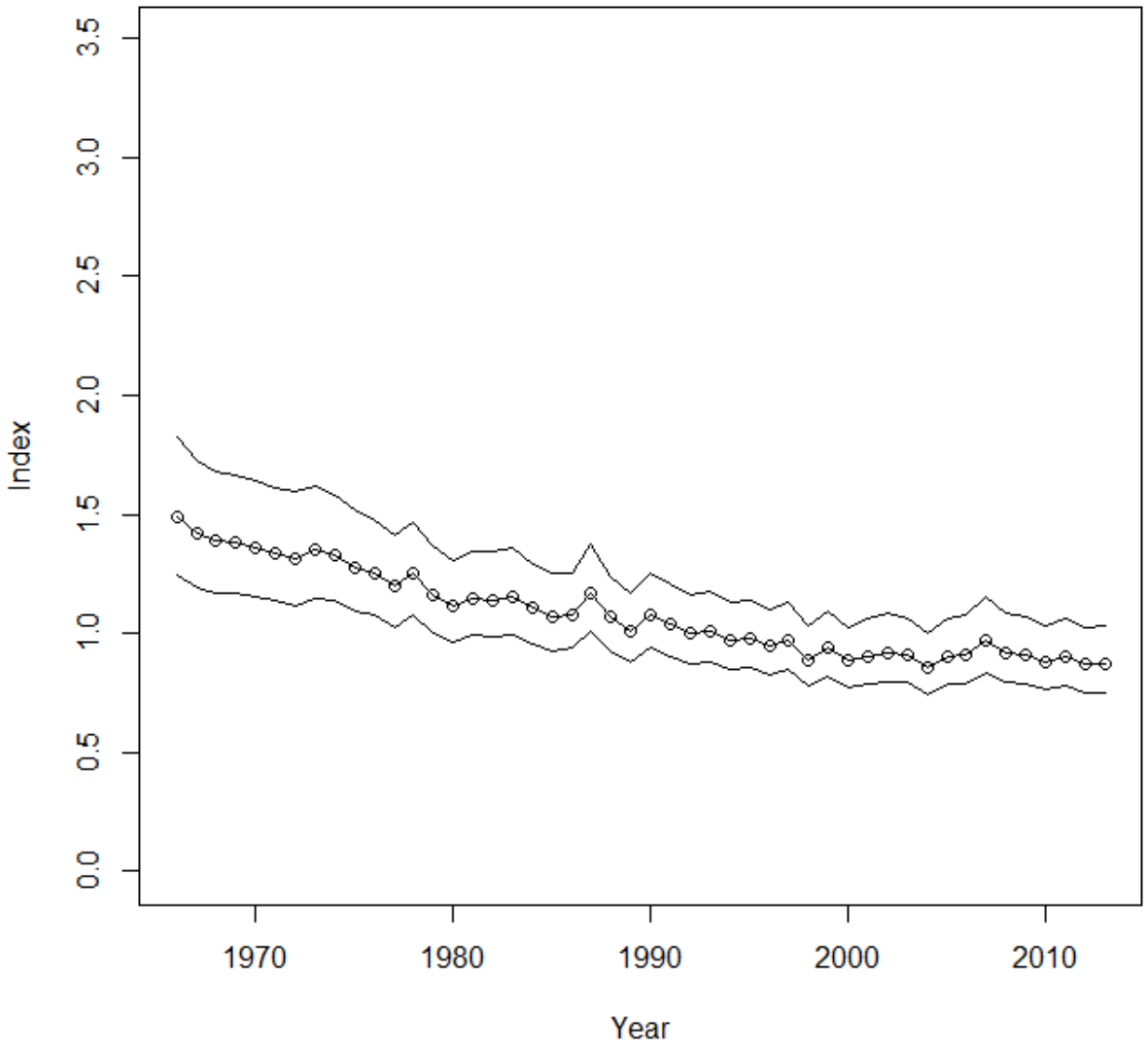

Figure 1. Long-term population trend of the Prothonotary Warbler in North America, according to the Breeding Bird Survey (Sauer *et al.* 2014). The graph shows upper and lower 95% confidence intervals bracketing the average annual indices (open circles).

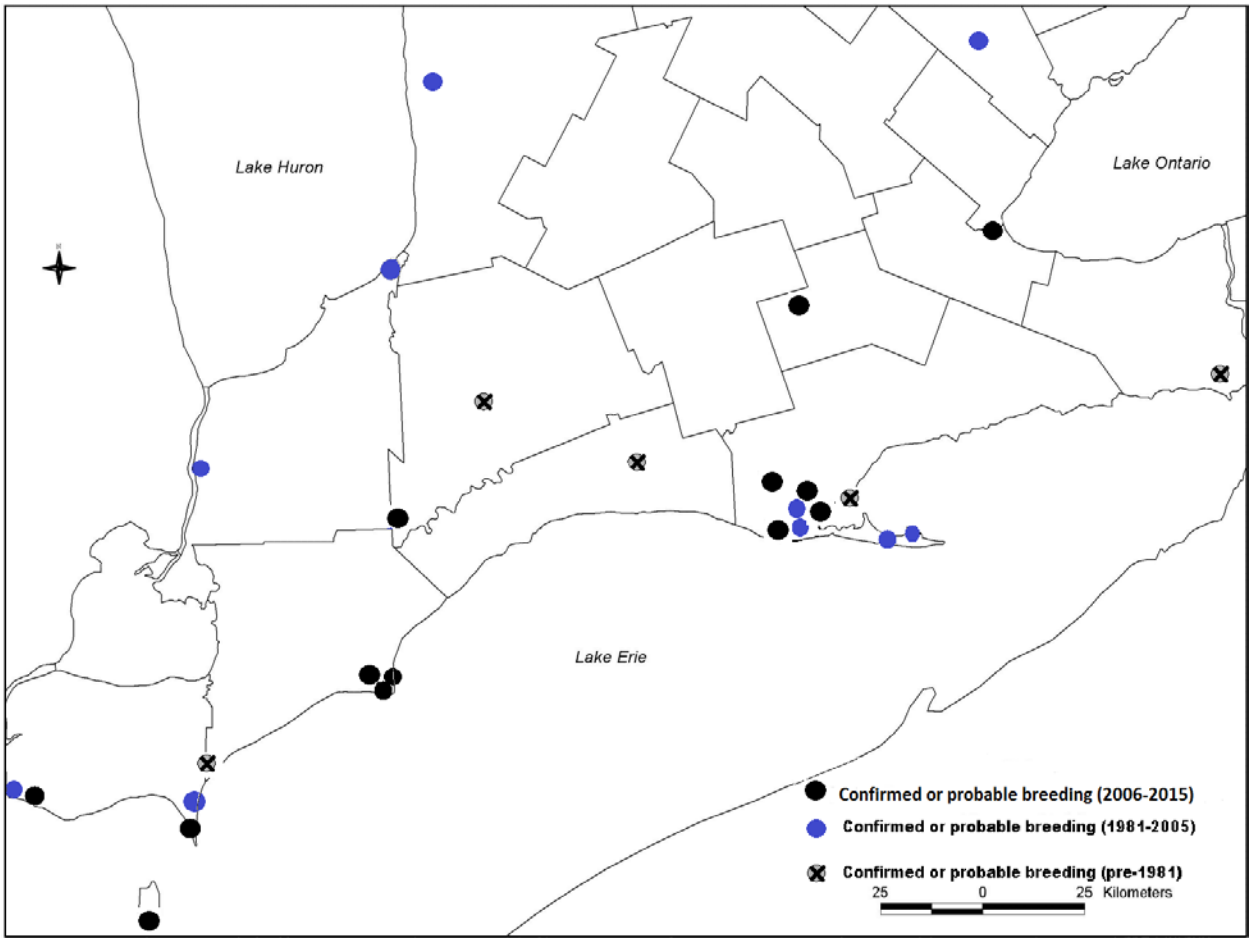

Figure 2. Prothonotary Warbler confirmed and probable breeding occurrences in Canada (southern Ontario) across various time periods, including the most recent 10-year period from 2006-2015. Extent of occurrence (EO) was calculated based on the polygon that encompasses records from the most recent 10-year time period.

Appendix A. List of sites known to support Prothonotary Warblers in Ontario during two time periods (1991-2005 and 2006-2015), plus the 2015 population estimate.

Municipal Region	Site name	Maximum population (1991-2005)[1]	Maximum population (2006-2015)[2]	2015 population estimate	History of occupancy	Ownership
Brant Co.	Hwy 403	-	1 pair	1 pair	Occupied in 2015; no other records.	Private
Chatham-Kent R.M.	Rondeau Provincial Park	15 pairs	5 pairs	3 pairs	Occupied annually since the 1930s.	Ontario Parks
Essex Co.	Amherstburg	3 pairs	-	-	Occupied from 2001 to 2004.	Private
Essex Co.	Holiday Beach	4 pairs	1 pair	1 unmated male	Occupied ephemerally since 1997.	Essex Region Conservation Authority; private
Essex Co.	Point Pelee National Park	-	1 pair	-	Occupied ephemerally since 2011.	Parks Canada
Essex Co.	Pelee Island (Fish Point)	-	1 pair	1 pair	Occupied ephemerally since 2011.	Ontario Parks
Essex Co.	Hillman Marsh	1 pair	-	-	Occupied only in 2003.	Essex Region Conservation Authority
Hamilton-Wentworth R.M.	Dundas Marsh	2 pairs	1 pair	-	Occupied ephemerally since the 1950s; last recorded in 2008.	Royal Botanical Gardens
Halton Co.	Caledon	1 pair	-	-	Occupied only in 2003.	Private
Middlesex Co.	Skunks Misery	-	1 pair	1 unmated male	Ephemeral; breeding has not been confirmed.	Private
Middlesex Co.	Chippewas of the Thames First Nation	-	2 unmated males	2 unmated males	Probably ephemeral; discovered in 2015; breeding has not been confirmed	First Nations
Norfolk Co.	Hahn Woods (base of Long Point)	5 pairs	2 pairs	1 pair	Occupied fairly regularly since the 1930s.	Canadian Wildlife Service; private
Norfolk Co.	Long Point (remote ridges)	1 pair	-	-	Ephemeral at scattered sites since early 1980s; not recorded since 1998.	Canadian Wildlife Service; private
Norfolk Co.	Backus Woods	5 pairs	6 pairs	6 pairs	Occupied in most years since the early 1980s.	Nature Conservancy of Canada; private
Norfolk Co.	Lower Big Creek	3 pairs	1 pair	-	Occupied ephemerally in scattered locations since the 1930s; last recorded in 2008.	Canadian Wildlife Service; private

Municipal Region	Site name	Maximum population (1991-2005)[1]	Maximum population (2006-2015)[2]	2015 population estimate	History of occupancy	Ownership
Norfolk Co.	Port Rowan (Dedrick Creek)	-	1 pair	-	Occupied in 2014; no other records.	Bird Studies Canada
Norfolk Co.	Langford Woods	-	1 pair	-	Occupied in 2013; no other records.	Long Point Basin Land Trust

[1] From COSEWIC (2007).

[2] From McCracken (2008), McCracken and Vande Somple (2009) and unpublished records compiled by J. McCracken.

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 (2016)

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.

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