COSEWIC
Rapid Review of Classification

on the

Greater Sage-Grouse
urophasianus subspecies

Centrocercus urophasianus urophasianus

in Canada

ENDANGERED
2021

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

The Rapid Review of Classification process is used by COSEWIC for Wildlife Species that have not changed status since the previous COSEWIC assessment. Readily available information from the previous status report or status appraisal summary, recovery documents, recovery teams, jurisdictions, conservation data centres, and species experts was initially reviewed by the relevant Species Specialist Subcommittees before being reviewed by COSEWIC. The following is a summary of the relevant information.

COSEWIC Rapid Review of Classification 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:

COSEWIC. 2021. COSEWIC Rapid Review of Classification on the Greater Sage-Grouse *urophasianus* subspecies *Centrocercus urophasianus urophasianus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xv pp. (https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html).

Production note:
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COSEWIC
Assessment Summary

Assessment Summary – November 2021

Common name
Greater Sage-Grouse *urophasianus* subspecies

Scientific name
Centrocercus urophasianus urophasianus

Status
Endangered

Reason for designation
In Canada, this large grouse is restricted to sagebrush-dominated landscapes in southern Alberta and Saskatchewan. The loss, fragmentation and degradation of this habitat as a result of oil and gas exploration, overgrazing by livestock, and conversion to crops has resulted in a substantial population decline over the past several decades. Trend estimates over the past three generations are imprecise, but monitoring efforts indicate further abandonment of some historically occupied breeding sites. Despite recovery efforts, the Canadian population remains small, with a current estimate of only 120 to 200 mature individuals. There may be limited immigration from Montana, but the numbers are likely insufficient to substantially increase the Canadian population.

Occurrence
Alberta, Saskatchewan

Status history
Given conditional designation of Threatened in April 1997. Status re-examined and designated Endangered in April 1998 based on a revised status report. Status re-examined and confirmed in May 2000, April 2008, and December 2021.

COSEWIC
Rapid Review of Classification

PREFACE

The previous status report on Greater Sage-Grouse (COSEWIC 2008) cited genetic evidence (from mtDNA, microsatellites, and SNP) suggesting that the *urophasianus* subspecies found in Alberta and Saskatchewan is not evolutionarily distinct from the *phaios* subspecies found in British Columbia (Benedict *et al*. 2003; Oyler *et al*. 2005). Nonetheless, the limited dispersal, wide geographic separation, and morphological distinctions between the populations was deemed to support their treatment as two distinct designatable units (COSEWIC 2008; Environment and Climate Change Canada 2017), a contention supported by further analysis of microsatellite variation across United States subpopulations (Cross *et al*. 2016). More recent whole-genome sequencing offers additional support for maintaining separate designatable units, by showing that United States populations that are contiguous with *urophasianus* in Canada are genetically distinct from birds breeding in Washington (Oh *et al*. 2019; Oyler-McCance *et al*. 2020). The latter are considered to be *phaios* and are the source of any potential immigration to British Columbia (Environment and Climate Change Canada 2017). Collectively, the available evidence meets the current COSEWIC (2020) criteria for recognizing distinct designatable units with respect to discreteness (criterion D1 – evidence of heritable markers and D2 – natural geographic disjunction) and significance (criterion S2 – heritable traits that would not be reconstituted if lost).

Since the last status report (COSEWIC 2008), an amended Recovery Strategy was developed for the *urophasianus* subspecies (Environment Canada 2014) that identified critical habitat. Moreover, the federal government issued an Emergency Protection Order, the first under the *Species at Risk Act,* which prohibits specific activities (including vegetation removal, construction, and noise) that would degrade habitat at recently occupied sites identified in the Recovery Strategy, including those on provincial land (Government of Canada 2013). Alberta also produced a provincial recovery plan (AESRD 2013), and Saskatchewan released a provincial conservation plan (Weiss and Prieto 2014). The South of the Divide Action Plan (Environment and Climate Change Canada 2016) and Grasslands National Park Multi-species Action Plan (Parks Canada Agency 2016) detail ongoing and recommended conservation actions targeting this and other prairie species in southwestern Saskatchewan, mainly derived from their respective recovery plans. None of these documents included a formal threat assessment of Greater Sage-Grouse.

The most recent population estimate for Alberta is 70-100 mature individuals, assuming that the sex ratio is one male to two females, that 90% of leks are known, and at least 75% of males were detected (Klem pers. comm. 2020; Nicholson pers. comm. 2020), consistent with the Recovery Strategy (Environment Canada 2014).

In Saskatchewan, the number of male Greater Sage-Grouse in Grasslands National Park declined by 4.5% from 2017 to 2021. In the park's West Block, there has been a steady decline since the late 1990s, with 15 or fewer mature individuals recorded annually since 2012, and a historical minimum in 2021, when the lone remaining lek became virtually inactive with only one displaying male (Liccioli, pers. comm. 2021). The demographic trend, low turnover rate observed through non-invasive genotyping data (Parks Canada Agency 2020), and geographic separation from other parts of the population (>50 km) suggest that there is little to no immigration to the West Block. Numbers in the East Block have fluctuated considerably over the past decade, dropping to near zero in 2013 and 2014, but rebounding quickly to near previous levels in 2015 and showing a modest further 18% increase from 2017 to 2021 (Liccioli, pers. comm. 2021). The fluctuations reflect population dynamics at a larger landscape scale, as documented by Montana Fish, Wildlife and Parks monitoring data, research on Greater Sage-Grouse movements linking the East Block to Valley County and Phillips County in Montana (Tack *et al*. 2012), anecdotal observation of movements across the border during nesting and brood-rearing, and post-release movements by captive-reared birds (Liccioli, pers. comm. 2021). The persistence of Greater Sage-Grouse in the East Block is therefore likely influenced by immigration and transboundary conservation efforts. Overall, the Saskatchewan population has ranged between 48 and 99 mature individuals since 2012 (Liccioli, pers. comm. 2021).

Recent attempts to directly augment the Canadian population include translocation of 79 birds from Montana between 2011 and 2016, and release of 66 captive-bred birds in 2018 (Heinrichs *et al.* 2018; Crowdis 2020). However, at most 38% of translocated birds and 3% of captive-bred birds are known to have survived to the next year (Whiklo and Nickerson 2015; Balderson 2017; Crowdis 2020). Thus, although true survival may be higher, and these efforts may help the population in the long run (Heinrichs *et al.* 2018), the effect of introduced birds on population size and trends has to date been negligible.

Status History:

Given conditional designation of Threatened in April 1997. Status re-examined and designated Endangered in April 1998 based on a revised status report. Status re-examined and confirmed in May 2000, April 2008, and December 2021.

Updated Map:

Not required, as no change in distribution is known; see previous assessment (COSEWIC 2008).

TECHNICAL SUMMARY

Centrocercus urophasianus urophasianus

Greater Sage-Grouse *urophasianus* subspecies

Tétras des armoises de la sous-espèce *urophasianus*

Range of occurrence in Canada (province/territory/ocean): Alberta, Saskatchewan

Demographic Information

Generation time (usually average age of parents in the population)	Approximately 3.8 years, based on IUCN estimate (Bird *et al.* 2020)
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Unknown overall. The number of males at active leks (male display grounds) has rebounded somewhat from the lowest point between 2011 and 2014, but remains lower than any year prior to 2009 (Nicholson pers. comm. 2020), and has continued to decline steadily in the West Block of Grasslands National Park (Liccioli pers. comm. 2021).
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations, whichever is longer up to a maximum of 100 years]	Unknown. Possible cyclicity in population makes short-term trends difficult to assess (COSEWIC 2008), as do re-introduction programs started in 2011, although the effect of the latter in Canada is currently negligible.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations, whichever is longer up to a maximum of 100 years].	Inferred 13% reduction over 3 generations (2009-2020), based on linear regression on counts at active leks in Alberta, but with high uncertainty (95% CI of -122%, 96%). Trend in Saskatchewan similar overall, with a steady decline in the West Block of Grasslands National Park and a short-term increase in the East Block, but with considerable fluctuations (Nicholson pers. comm. 2020; Liccioli pers. comm. 2021), and some concern about the reliability of data prior to 2014 (Environment Canada 2014; Weiss and Prieto 2014).
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations, whichever is longer up to a maximum of 100 years].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any period [10 years, or 3 generations, whichever is longer up to a maximum of 100 years], including both the past and the future.	Unknown
Are the causes of the decline clearly understood?	Yes, primarily disturbance, habitat loss and degradation, predation by increasing native wildlife, weather extremes, and disease, although the impact of some of these threats is unclear (Environment Canada 2014).

Have the causes of the decline ceased?	No, key concerns are ongoing, despite conservation efforts
Are the causes of the decline clearly reversible?	Yes, most relate to disturbance and habitat loss or degradation, which are reversible (Environment Canada 2014).
Are there extreme fluctuations in number of mature individuals?	No, inter-annual variation in population size may be cyclic, but not extreme (COSEWIC 2008).

Extent and Occupancy information

Estimated extent of occurrence (EOO)	600-14,000 km². Upper limit based on minimum convex polygon containing critical habitat defined in Environment Canada (2014), but current EOO as indicated by distribution of records is likely much smaller.
Index of area of occupancy (IAO), reported as 2x2 km grid value.	80-164 km². Upper limit based on 2x2 km grid surrounding each of 41 potentially occupied leks listed in Environment Canada (2014), but IAO based on recent observations is much smaller.
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?	No, individuals can disperse widely, and modelling suggests that survival within habitat patches is much more important to population viability than is dispersal (Heinrichs *et al.* 2018).
Number of "locations"∗ (use plausible range to reflect uncertainty if appropriate)	5-20, based on the number of active leks annually since 2002, but likely closer to the low end of the range (e.g., only 5 leks detected in 2020).
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	Likely yes.
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	Yes, inferred based on decline in number of active leks.
Is there an [observed, inferred, or projected] continuing decline in number of subpopulations?	No
Is there an [observed, inferred, or projected] continuing decline in number of "locations"*?	Yes, inferred based on decline in number of leks (Nicholson pers. comm. 2020).
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality of] habitat?	Yes, decline in extent and quality of habitat inferred based on threats identified in recovery strategy (Environment Canada 2014), although recovery actions, notably the Emergency Protection Order of Critical Habitat, may be slowing the decline.
Are there extreme fluctuations in number of subpopulations?	No
Are there extreme fluctuations in number of "locations"*?	No

∗ See Definitions and Abbreviations on COSEWIC website and IUCN for more information on this term.

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	N Mature Individuals (give plausible ranges)
Alberta	70-100 (Klem pers. comm. 2020; Nicholson pers. comm. 2020)
Saskatchewan	50-100, based on annual estimates of 48 to 99 since 2012 (Liccioli pers. comm. 2021).
Total	120-200, assuming sex ratio of 1 male to 2 females. High estimate assumes 75% of males were detected, and 90% of leks are known (as in Environment Canada 2014).

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations whichever is longer up to a maximum of 100 years, or 10% within 100 years]?	Unknown. Analysis not conducted.

Threats and Limiting Factors

Was a threats calculator completed for this species?	No, but threats were identified in the Recovery Strategy (Environment Canada 2014).	Overall threat impact: High (based on Environment Canada 2014)
Key threats identified in the Recovery Strategy (Environment Canada 2014) are: • IUCN 11 (Climate change and severe weather): habitat degradation from droughts (11.2) and mortality from temperature extremes (11.3) and storms & flooding (11.4) • IUCN 8 (Invasive and other problematic species and genes): mortality from invasive disease [West Nile virus] (8.1) and problematic native species (8.2) • IUCN 3 (Energy production and mining): habitat loss and degradation from oil & gas drilling (3.1) and renewable energy (3.3) • IUCN 4 (Transportation and service corridors): disturbance from roads (4.1), collision with utility & service lines (4.2) • IUCN 2 (Agriculture and aquaculture): habitat loss to annual and perennial non-timber crops (2.1) and some forms of livestock farming and ranching (2.3) • IUCN 7 (Natural system modifications): habitat degradation from dams and water management/use (7.2)		
What additional limiting factors are relevant? Near-obligate relationship with areas of sagebrush that currently require protection and active management, e.g., controlled grazing, at a landscape scale (Rowland 2019), is the main limiting factor for this species (COSEWIC 2008)		

Rescue Effect (natural immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Imperilled (S2) in Montana, where there is a small and fluctuating but largely stable population (Montana Fish, Wildlife and Parks 2019)
Is immigration known or possible?	Yes, immigration from Montana is thought to be the main source of Canadian birds (Environment Canada 2014), based on microsatellite data (Row *et al.* 2018).
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Are conditions deteriorating in Canada?[+]	Yes, habitat subject to threats listed above
Are conditions for the source (i.e., outside) population deteriorating?[+]	Yes, habitat loss and fragmentation ongoing in the U.S. (NatureServe 2020)
Is the Canadian population considered to be a sink?[+]	Unknown
Is rescue from outside populations likely?	Possible, as immigration is already occurring, there is sufficient habitat in Canada, and the source population is not declining, but unlikely, as simulations suggest that rescue would require active release programs (Heinrichs *et al*. 2019)

Occurrence Data Sensitivity

Are occurrence data of this species sensitive?	No

Status History

COSEWIC: Given conditional designation of Threatened in April 1997. Status re-examined and designated Endangered in April 1998 based on a revised status report. Status re-examined and confirmed in May 2000, April 2008, and December 2021.

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

Status and Reasons for Designation

Status:	**Alpha-numeric codes:**
Endangered	D1

Reasons for designation:
In Canada, this large grouse is restricted to sagebrush-dominated landscapes in southern Alberta and Saskatchewan. The loss, fragmentation and degradation of this habitat as a result of oil and gas exploration, overgrazing by livestock, and conversion to crops has resulted in a substantial population decline over the past several decades. Trend estimates over the past three generations are imprecise, but monitoring efforts indicate further abandonment of some historically occupied breeding sites. Despite recovery efforts, the Canadian population remains small, with a current estimate of only 120 to 200 mature individuals. There may be limited immigration from Montana, but the numbers are likely insufficient to substantially increase the Canadian population.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Insufficient data to reliably infer, project, or suspect population trends.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. Nearly meets thresholds for Endangered B2ab(ii,iii,iv) and Threatened or Endangered B1ab(ii,iii,iv) given uncertain EOO estimates, but the number of locations may exceed thresholds.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Number of mature individuals (120-200) is below the threshold for Endangered, but there is no clear evidence of continuing decline in the number of mature individuals.
Criterion D (Very Small or Restricted Population): Meets Endangered, D1. Number of mature individuals estimated to be 120-200.
Criterion E (Quantitative Analysis): Analysis not conducted.

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Authorities Contacted

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INFORMATION SOURCES

AESRD (Alberta Environment and Sustainable Resource Development). 2013. Alberta Greater Sage-grouse Recovery Plan 2013–2018. Alberta Environment and Sustainable Resource Development, Alberta Species at Risk Recovery Plan No. 30. Edmonton, Alberta. 46 pp.

Aldridge, C.L., and M.S. Boyce. 2007. Linking occurrence and fitness to persistence: a habitat-based approach for Greater Sage-Grouse. Ecological Applications 17:508-526.

Aldridge, C.L., and R.M. Brigham. 2003. Distribution, abundance and status of the Greater Sage-Grouse, *Centrocercus urophasianus*, in Canada. Canadian Field Naturalist 117:25-34.

Benedict, N.G., S.J. Oyler-McCance, S.E. Taylor, C.E. Braun, and T.W. Quinn. 2003. Evaluation of the eastern (*Centrocercus urophasianus urophasianus*) and western (*Centrocercus urophasianus phaios*) subspecies of sage-grouse using mitochondrial control-region sequence data. Conservation Genetics 4:301-310.

Bird, J., R. Martin, H.R. Akçakaya, J. Gilroy, I.J. Burfield, S.T. Garnett, A. Symes, J. Taylor, C.H. Şekercioğlu, and S.H.M. Butchart. 2020. Generation lengths of the world's birds and their implications for extinction risk. Conservation Biology 34:1252–1261.

COSEWIC. 2008. COSEWIC assessment and update status report on the Greater Sage-Grouse *Centrocercus urophasianus, Phaios* subspecies and *Urophasianus* subspecies, *Centrocercus urophasianus urophasianus,* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 38 pp.

COSEWIC. 2020. Guidelines for Recognizing Designatable Units. Appendix F5 of the COSEWIC Operations and Procedures Manual. Committee on the Status of Endangered Wildlife in Canada. Ottawa, Ontario. 11 pp.

Cross, T.B., D.E. Naugle, J.C. Carlson, and M.K Schwartz. 2016. Hierarchical population structure in greater sage-grouse provides insight into management boundary delineation. Conservation Genetics 17:1417-1433.

Crowdis, K.D. 2020. Resurgence: Boosting Greater Sage-Grouse populations. Conservation: A Publication of the Alberta Conservation Association. Fall/Winter 2000:40-43

Environment Canada. 2014. Amended Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi + 53 pp.

Environment and Climate Change Canada. 2016. Action Plan for Multiple Species at Risk in Southwestern Saskatchewan: South of the Divide [Proposed]. *Species at Risk Act* Action Plan Series. Environment and Climate Change Canada, Ottawa, Ontario. xi + 127 pp.

Environment and Climate Change Canada. 2017. Recovery Strategy for the Greater Sage-Grouse *phaios* subspecies (*Centrocercus urophasianus phaios*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vii + 19 pp.

Government of Canada. 2013. Emergency order for the protection of the Greater Sage-grouse. SOR/2013-202. The Canada Gazette. Ottawa, Ontario. 112 pp.

Heinrichs, J.A., C.L. Aldridge, D.L. Gummer, A.P. Monroe, and N.H. Schumaker. 2018 Prioritizing actions for the recovery of endangered species: Emergent insights from Greater Sage-grouse simulation modeling. Biological Conservation 218:134-143.

Heinrichs, J.A., D.T. McKinnon, C.L. Aldridge, and A. Moehrenschlager. 2019. Optimizing the use of endangered species in multi-population collection, captive breeding and release programs. Global Ecology and Conservation 17:p.e00558.

Klem, M. pers. comm. 2020. *Email correspondence to A.G. Horn.* November 2020. Priority Species at Risk Biologist, Fish and Wildlife Management, Alberta Environment and Parks, Medicine Hat, Alberta.

Liccioli, S. pers. comm. 2021. *Email correspondence to M.A. Gahbauer.* November 2021. Species at Risk Scientist, Grasslands National Park, Parks Canada, Val Marie, Saskatchewan.

Lloyd, N., K. Traylor-Holzer, J. Mickelberg, T. Stephens, M. Schroeder, J. Heinrichs, B. Prieto Diaz, and A. Moehrenschlager (eds.). 2014. Greater Sage-Grouse in Canada Population and Habitat Viability Assessment Workshop Final Report. IUCN SSC Conservation Breeding Specialist Group, Apple Valley, Minnesota.

Montana Fish, Wildlife and Parks. 2019. Montana Greater Sage-grouse Population Report. Montana Fish, Wildlife and Parks, Helena, Montana. Website: https://leg.mt.gov/ [accessed January 2021].

NatureServe. 2020. NatureServe Explorer: *Centrocercus urophasianus*. Website: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.105314/Centrocercus_urophasianus [accessed January 2021].

Nicholson, J. pers. comm. 2020. *Email correspondence to A.G. Horn.* July 2020. Senior Wildlife Biologist. Fish and Wildlife Management, Alberta Environment and Parks, Edmonton, Alberta.

Oh, K.P., C.L. Aldridge, J.S. Forbey, C.Y. Dadabay, and S.J. Oyler-McCance. 2019. Conservation genomics in the Sagebrush Sea: population divergence, demographic history, and local adaptation in Sage-Grouse (*Centrocercus* spp.). Genome Biology and Evolution 11:2023–2034.

Oyler-McCance, S.J., S.E. Taylor, and T.W. Quinn. 2005. A multilocus population genetic survey of the Greater Sage-Grouse across their range. Molecular Ecology 14:1293–1310.

Oyler-McCance, S.J., K.P. Oh, S.J. Zimmerman, and C.L. Aldridge. 2020. The transformative impact of genomics on sage-grouse conservation and management. Pp. 1-24 *in* P.A. Hohenlohe and O.P. Rajora (eds.). Population Genomics: Wildlife. Springer, Cham, Switzerland.

Parks Canada Agency. 2016. Multi-species Action Plan for Grasslands National Park of Canada. Species at Risk Act Action Plan Series. Parks Canada Agency, Ottawa, Ontario. iv + 57 pp.

Parks Canada Agency. 2020. Greater sage-grouse population monitoring annual report. Grasslands National Park, Val Marie, Saskatchewan. 8 pp.

Row, J.R., K.E. Doherty, T.B. Cross, M.K. Schwartz, S.J. Oyler-McCance, D.E. Naugle, S.T. Knick, and B.C. Fedy. 2018. Quantifying functional connectivity: The role of breeding habitat, abundance, and landscape features on range-wide gene flow in sage-grouse. Evolutionary Applications 11:1305-1321.

Rowland, M.M. 2019. The effects of management practices on grassland birds—Greater Sage-Grouse (*Centrocercus urophasianus*). Chap. B *In* D.H. Johnson, L.D., Igl, J.A. Shaffer, and J.P. DeLong (eds.). The effects of management practices on grassland birds. U.S. Geological Survey Professional Paper 1842.

Tack, J.D., D.E. Naugle, J.C. Carlson, and P.J. Fargey. 2012. Greater Sage-Grouse *Centrocercus urophasianus* migration links the USA and Canada: a biological basis for international prairie conservation. Oryx 46:64-68.

USDA Forest Service. 2020. Forest Service Greater Sage-grouse Monitoring Annual Report October 2015-September 2019. USDA Forest Service, Helena, Montana.

Weiss, M., and B. Prieto. 2014. A conservation plan for Greater Sage-Grouse in Saskatchewan. Fish and Wildlife Branch, Regina, Saskatchewan.

Whiklo, T., and J. Nicholson. 2015. Translocation of Greater Sage-grouse from Montana to Alberta: 2011-2013 progress report. Alberta Environment and Sustainable Resource Development. Edmonton, Alberta. 21 pp

WRITER OF RAPID REVIEW OF CLASSIFICATION

Andrew G. Horn

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
(2021)

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
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