

COSEWIC
Assessment and Status Report

on the

Snowy Owl
Bubo scandiacus

in Canada



THREATENED
2025

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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

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Previous report(s):

COSEWIC. 1995. COSEWIC assessment and status report on the Snowy Owl *Bubo scandiacus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 16 pp.

Production note:

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Snowy Owl (Bylot Island, Nunavut, August 2014); photo by Audrey Robillard. Used with permission.

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COSEWIC Assessment Summary

Assessment Summary –May 2025

Common name

Snowy Owl

Scientific name

Bubo scandiacus

Status

Threatened

Reason for designation

An estimated 90-95% of the North American population of this Arctic owl breeds in Canada. In 1995 the species was assessed by COSEWIC as Not at Risk because it was widespread, with no evidence of decline. Since then, improved estimation techniques have revised the population size downward by an order of magnitude. Data from the North American Christmas Bird Count, which capture trends in the southern portion of the wintering range, show a decline of 42.6% (2.3% annually) over the last 3 generations or 24 years. Indigenous knowledge from Baffin Island and the Yukon coast reports that this species is observed less frequently than before, likely due to warming conditions. Ongoing threats to the species include avian influenza, poisoning with anticoagulant rodenticides, collisions, electrocution, and, although specific impacts over the next three generations are uncertain, changes on breeding and wintering grounds brought about by climate change.

Occurrence

Yukon, Northwest Territories, Nunavut, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

Status history

Designated Not at Risk in April 1995. Status re-examined and designated Threatened in May 2025.



COSEWIC Executive Summary

Snowy Owl *Bubo scandiacus*

Wildlife Species Description and Significance

A large, unmistakable white owl from the Arctic, Snowy Owl (*Bubo scandiacus*) is a highly mobile species showing irruptive patterns of abundance on both its breeding and non-breeding ranges. As a top predator of tundra ecosystems, its numbers vary tremendously (0 to 0.12 nest/km²) from year to year in a given location according to the abundance of prey. Snowy Owl has significant importance in both Indigenous and non-Indigenous legends and cultures across Canada, including as Quebec's provincial bird.

Aboriginal (Indigenous) Knowledge

All species are significant and are interconnected and interrelated. Aboriginal Traditional Knowledge (ATK) has been included under relevant headings of the report.

Distribution

Snowy Owl breeds across the circumpolar world, within the tundra ecosystems of Greenland, Norway, Finland, Russia, Sweden, USA (Alaska), and Canada. While breeding (May – September) is limited to these ecosystems, Snowy Owl occurs in every province and territory in Canada during the non-breeding season (October – April).

Habitat

Snowy Owl uses a variety of habitats throughout its annual cycle. During the breeding season, it typically nests on mesic to dry tundra. During the non-breeding season, it can be found inland in open country (tundra or temperate grasslands), but also often uses coastlines, ice-covered lakes (e.g., Great Lakes), and even sea ice.

Biology

Snowy Owl is a long-lived bird (annual adult survival rate between 85 and 93%) with a high reproductive potential (average clutch size = 7.1 eggs) and annual reproductive rate of >85%. The juvenile survival rate is low (~68%). Breeding can begin at 2 years of age, but average age of first breeding is likely around 4 years. Across its range, breeding location and success are tightly linked with the local abundance of the preferred prey, lemmings (subfamily Microtinae), which represent as much as 95% of Snowy Owl diet during the breeding season. With lemming populations exhibiting large fluctuations in abundance

annually and the owl's high mobility potential, Snowy Owl is highly dispersive, showing very low fidelity to breeding sites. It exemplifies an irruptive species (those that show large-scale irregular movements related to food availability).

Population Sizes and Trends

It is very difficult to estimate the population size of Snowy Owl; however, several lines of evidence suggest there are between 13,000 and 16,000 mature individuals in Canada. This estimate is broadly consistent with previous ones made using mtDNA (14,000 adult females worldwide) or measured via nesting density on the breeding grounds and extrapolated across available tundra ecosystems (ranging from a minimum of 7,000–8,000 pairs to a maximum of 25,000 pairs worldwide). These revised estimates are far lower than the 290,000 individuals estimated worldwide in 2004, with the current estimates the result of a combination of new (e.g., genetics) and more accurate (e.g., modelling for irruptive behaviour) methods instead of a population decline of an order of magnitude.

Nonetheless, various indices suggest a continuing decline in Canada. Data from the North American Christmas Bird Count (CBC) capture trends in the southernmost portion of the wintering population, and are thought to represent the Canadian population well, as 90-95% of the Snowy Owls in North America breed in Canada. These data show a decline of 42.6% over the last 24 years (3 generations), based on a long-term decline of 2.3% annually. For the Prairie Potholes region, where a high proportion of adults are thought to overwinter, CBC data show a decline of 38.9% over the same timeframe.

Threats and Limiting Factors

Although impacts of climate change are assessed as Unknown because they are hard to quantify over the 3-generation period of a threats assessment, this is the single most serious plausible threat to the species overall because of current and anticipated changes to breeding and wintering habitat in rapidly changing tundra ecosystems. Warming temperatures in breeding habitat could be affecting lemming populations (the main food item) via formation of ice crusts in the snowpack. A worldwide shrinking of tundra ecosystems towards the pole through shrubification (i.e., advancing Arctic shrubline in response to climate warming) and the intensification of rainstorms may also threaten Snowy Owl, with these effects increasingly prominent in the southern part of the tundra biome. Some adults winter in the Arctic sea ice, which is in decline.

During the non-breeding season, mortality associated with anthropogenic structures and vehicles seems to be affecting juveniles heavily, although adults are also affected. Specifically, 22-24% of mortality on the non-breeding grounds comes from weather (exposure), disease, predation, or starvation, while automobile collisions (18-22%), airplane collisions (9-11%) and electrocution (3-6%) are major sources of anthropogenic mortality. Snowy Owl is also exposed to indirect contamination (mostly anticoagulant rodenticides) and diseases (e.g., Highly Pathogenic Avian Influenza, West Nile Virus), of which the population-level consequences are likely important, but currently uncertain.

Protection, Status, and Ranks

Snowy Owl is not protected in Canada under the *Migratory Birds Convention Act*, 1994, as owls (Strigidae) were excluded from the original convention, but it receives protection under a *Wildlife Act* (or equivalent) in every province and territory. It is globally assessed as Vulnerable by IUCN and on the Watch list (yellow) for North America by Partners in Flight. Its global conservation status is ranked by NatureServe as G4 (Apparently Secure) and in Canada as nationally Secure (N5B,N5N,N5M), although it is Critically Imperilled in Yukon (S1) and Labrador (S1B), and Vulnerable in Manitoba and the island of Newfoundland (S3N). Although Snowy Owl regularly nests in protected areas such as national parks (e.g., Sirmilik, Auyuittuq, Quttinirpaaq) and uses them as stopover sites (e.g., Grasslands NP), most of the species' range falls outside of national park boundaries or other protected areas.

TECHNICAL SUMMARY

Bubo scandiacus

Snowy Owl

Harfang des neiges

Ookpik, Ukpik, Ukpikjuaq, Upialuk

Uapikunu

Range of occurrence in Canada: Yukon, Northwest Territories, Nunavut, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

Demographic Information:

Generation time (usually average age of parents in the population)	8 years	Bird <i>et al.</i> 2020, McCabe <i>et al.</i> 2024.
Is there an [observed, estimated, inferred, or projected] continuing decline in number of mature individuals?	Yes	Estimated based on Christmas Bird Count (CBC) population trends for Canada and US combined (Meehan <i>et al.</i> 2022; Meehan pers. comm. 2025; the combined region is thought to best represent Canada's wintering Snowy Owl population), and eBird trend analyses (Fink <i>et al.</i> 2023).
[Observed, estimated, or projected] percent of continuing decline in total number of mature individuals within 3 years [or 1 generation; whichever is longer up to a maximum of 100 years]	-16.3% (95% CIs: -62.8, -4.7)	Estimated. Short-term CBC trend for Canada and US combined (2013-2023, or approx. 1 gen; Meehan pers. comm. 2025).
Observed, estimated, or projected] 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.	Not calculated for 2-generation period.

[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last 24 years (3 generations)	Yes, estimated for last 24 years as -42.6% (95% CI: -58.1%, -30.4%) on the southern non-breeding range; and -38.9% (95% CI: -50.4%, -27.0%).	Interpolated from long-term (1966-2023) North American CBC trend of -2.3% annually (Meehan pers. comm. 2025). Interpolated from long-term (1966-2023) CBC trend of -2.0% annually for the Prairie Potholes Bird Conservation Region (BCR 11; Meehan pers. comm. 2025); wintering Snowy Owl on the prairies include a high proportion of adults and this region may be more representative of the breeding population overall.
[Projected, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations, up to a maximum of 100 years]	Unknown. Range of 3-70% based on threats calculator.	Suspected based on ongoing threats. Although future rate of change uncertain, decline over next three generations unlikely to be less than that of past three generations as climate-related and other threats appear to be increasing.
[Observed, estimated, inferred, projected, or suspected] percent [reduction or increase] in total number of mature individuals over any period of 10 years [or 3 generations; whichever is longer, up to a maximum of 100 years], including both the past and future (up to a maximum of 100 years in future)	Ongoing decline suspected at 3-70% based on threats calculator.	Given nature of threats, decline into immediate future unlikely to be less than that of past three generations (see box 6).
Are the causes of the decline clearly reversible?	Some yes, others no	Climate change is likely one of the most important factors over the longer term, and reversing its effects seems unlikely over the short term, especially given the various indirect effects through the food web. Same applies for highly pathogenic avian influenza (HPAI). Management actions could however be implemented to reduce the negative effects of rodenticides, electrocution, and vehicle collisions.
Are the causes of the decline clearly understood?	Some yes, others no	Possible indirect effects of climate change through the food web. Rodenticides, HPAI, and vehicle collisions are all directly related to mortality.

Are the causes of the decline clearly ceased?	No	Ongoing climate change. Habitat changes in the southern portion of wintering range. Rodenticides still readily available in stores and heavily used. Collisions with vehicles happening. HPAI outbreaks are increasingly common in wild birds.
Are there extreme fluctuations in number of mature individuals	No	Survival rate in adults is high (Therrien <i>et al.</i> 2012) despite irruptive patterns in reproductive output (i.e., doesn't meet definition of "extreme fluctuations").

Extent and Occupancy Information:

Estimated extent of occurrence (EOO)	12,401,744 km ²	Based on known occurrences from eBird database, from 1995-2022.
Index of area of occupancy (IAO), reported as 2x2 km grid value	Unknown, but minimum of 4,092 km ²	Based on breeding occurrences entered into eBird, from 1995-2022.
Is the population "severely fragmented", i.e., is >50% of individuals or >50% of the total area "occupied" (as a proxy for number of individuals) in habitat patches that are both (a) smaller than required to support a viable subpopulation, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. No	a) large patches of tundra habitat available across range b) high dispersal capacity
Number of "locations" (use plausible range to reflect uncertainty if appropriate)	Unknown, but >>10	Although climate change is affecting ecosystems across the Arctic, the indirect climate-mediated effects that threaten Snowy Owl (e.g., shrubification, impacts on prey populations, sea ice loss) vary across regions, and other threats are more regional in nature; therefore, the number of threat-based locations across the Canadian range is likely much greater than ten.
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	Unknown	Potential decline in EOO if tundra ecosystems converted through shrubification.

Is there an [observed, inferred, or projected] continuing decline in area of occupancy?	Yes	Climate change could affect the extent of tundra ecosystems, with them retreating north and affecting amount of breeding habitat/ territories available; continuing IAO decline inferred given population decline.
Is there an [observed, inferred, or projected] continuing decline in number of subpopulations?	No	No genetic differentiation (no subpopulations given the species' high mobility and dispersal).
Is there an [observed, inferred, or projected] continuing decline in number of "locations"?	Unknown	
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Yes	Suitable Arctic tundra ecosystems shrinking and changing due to shrubification, and there is a reduction of Arctic winter sea ice (i.e., wintering habitat for some birds). These could also reduce prey availability.
Are there extreme fluctuations in number of subpopulations?	Not applicable – only one population.	
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	Range varies tremendously on an annual basis following the abundance of prey (lemmings), but does not meet definition of "extreme fluctuations".

Number of Mature Individuals (by subpopulation):

Subpopulation 1	Estimated to be between 13,000 and 16,000.	Based on several lines of evidence, including estimate of North American effective population size of 15,792, with an <i>Ne/Nc</i> ratio close to 1 (Gousy-Leblanc <i>et al.</i> 2023); a recent estimate of 15,000 breeding individuals for North America (Partners in Flight 2025); and assuming that 90-95% of global population occurs in Canada based on extent of tundra habitat (Slaymaker <i>et al.</i> 2023).
Total	13,00–16,000	Only one population in Canada

Quantitative Analysis:

Is the probability of extinction in the wild at least 20% within 20 years [or 5 generations], or 10% within 100 years]	Unknown	Analysis not conducted.
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Threats:

Was a threats calculator completed for this species?	Yes (see Appendix 1)	Overall assigned threat impact: High – Medium (2024)
Key threats were identified as: i. Invasive & other problematic species & genes (IUCN #8) – High – Low impact ii. Transportation & service corridors (IUCN #4) – Medium – Low impact iii. Pollution (IUCN #9) – Medium – Low impact iv. Residential & commercial development (IUCN #1) – Low impact v. Energy production & mining (IUCN #3) – Low impact vi. Climate change (habitat shifting and alteration) (IUCN #11) – Low impact vii. Agriculture & aquaculture (IUCN #2) – Unknown impact viii. Biological resource use (IUCN #5) – Unknown impact ix. Intrusions and disturbance (IUCN #6) – Unknown impact		
What limiting factors are relevant? Very sensitive to any change in the population dynamics of lemmings (Schmidt <i>et al.</i> 2012)		

Rescue Effect (from outside Canada):

Status of outside population(s) most likely to provide immigrants to Canada.	Declining	Populations outside of Canada are in low Arctic tundra and therefore likely to be declining because of climate change and the associated shrinking of the tundra biome. McCabe <i>et al.</i> (2024) show range-wide decline on breeding grounds.
Is immigration known or possible?	Yes	Large dispersal potential.
Would immigrants be adapted to survive in Canada?	Yes	Similar tundra habitat.
Is there sufficient habitat for immigrants in Canada?	Yes	Canada represents the core breeding habitat for the species worldwide.
Are conditions deteriorating in Canada?	Yes	Area of tundra and sea ice shrinking.
Are conditions for the source (i.e., outside) population deteriorating?	Yes	Climate change happening worldwide.
Is the Canadian population considered to be a sink?	No	Canada is potentially the primary stronghold for the species worldwide.

Is rescue from outside Canada likely, such that it could lead to a change in status?	No	Using climate change projections provided by IPCC (2021), Canada will remain the country harbouring the most breeding habitat for Snowy Owl worldwide.
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Wildlife Species with Sensitive Occurrence Data (general caution for consideration):

Could release of certain occurrence data result in increased harm to the Wildlife Species or its habitat?	Yes	II. Disturbance by observation Locations frequented by owls in the non-breeding season are often not disclosed due to disturbance by photographers and the general public. Disturbance is well-documented when owl locations are known.
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Status History:

COSEWIC	Designated Not at Risk in April 1995. Status re-examined and designated Threatened in May 2025.
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Status and Reasons for Designation:

Status	Threatened
Alpha-numeric codes	A2b+4b
Reason for change in status	I.ii, IV.vii
Reasons for designation	An estimated 90-95% of the North American population of this Arctic owl breeds in Canada. In 1995 the species was assessed by COSEWIC as Not at Risk because it was widespread, with no evidence of decline. Since then, improved estimation techniques have revised the population size downward by an order of magnitude. Data from the North American Christmas Bird Count, which capture trends in the southern portion of the wintering range, show a decline of 42.6% (2.3% annually) over the last 3 generations or 24 years. Indigenous knowledge from Baffin Island and the Yukon coast reports that this species is observed less frequently than before, likely due to warming conditions. Ongoing threats to the species include avian influenza, poisoning with anticoagulant rodenticides, collisions, electrocution, and, although specific impacts over the next three generations are uncertain, changes on breeding and wintering grounds brought about by climate change.

Applicability of Criteria:**A: Decline in Total number of Mature Individuals:**

Meets Threatened, A2b+4b.	Estimated decline of 38.9% (95% CI: -50.4%, -27.0%) in number of mature individuals over last 24 years (3 generations), based on Christmas Bird Count (CBC) data for the Prairie Potholes region (Bird Conservation Region 11), where wintering birds include a high proportion of adults and trends in this region are likely more representative of the breeding population. CBC data also provide an estimated 3-generation decline of 42.6% (95% CI: -58.1%, -30.4%) for the southern non-breeding range overall. There is also a projected and inferred decline of at least 30% in number of mature individuals over 3 generations spanning past and future based on the likelihood that climate-related and other threats will increase, yielding an ongoing decline at least as great as that of the past three generations.
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B: Small Range and Decline or Fluctuation

Not applicable.	EOO and IAO exceed thresholds for Threatened.
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C: Small and Declining Number of Mature Individuals

Not applicable.	Number of mature individuals estimated at between 13,000 and 16,000, exceeding threshold for Threatened.
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D: Very Small or Restricted Population

Not applicable.	Estimate of mature individuals exceeds thresholds for D1, and population is not vulnerable to rapid and substantial decline.
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E: Quantitative Analysis

Insufficient data.	Analysis not conducted.
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If a species is proposed as Special Concern, Data Deficient, Extirpated or Extinct, list the applicable guidelines, examples, or other considerations from O&P Appendix E3.

- NA.

PREFACE

Snowy Owl was previously assessed as Not at Risk in Canada in 1995. Considerable research has been carried out on the species since that time. In 2017, a collaborative effort led by Snowy Owl researchers worldwide provided more accurate population numbers that resulted in a much lower global population estimate. In the same year, the IUCN uplisted this species from Least Concern to Vulnerable, based on rapid population declines (BirdLife International 2021).



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 (2025)

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 is 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.

COSEWIC Status Report

on the

Snowy Owl *Bubo scandiacus*

in Canada

2025

TABLE OF CONTENTS

WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE	4
Name and Classification	4
Description of Wildlife Species	6
Designatable Units	6
Special Significance	6
ABORIGINAL (INDIGENOUS) KNOWLEDGE	7
Cultural Significance to Indigenous Peoples.....	7
DISTRIBUTION	7
Global Range.....	7
Canadian Range.....	8
Population Structure	9
Extent of Occurrence and Area of Occupancy	9
Fluctuations and Trends in Distribution.....	9
BIOLOGY AND HABITAT USE	10
Life Cycle and Reproduction.....	10
Habitat Requirements	11
Movements, Migration, and Dispersal	11
Interspecific Interactions	12
Physiological, Behavioural, and Other Adaptations	13
Limiting Factors	13
POPULATION SIZES AND TRENDS	14
Data Sources, Methodologies, and Uncertainties.....	14
Abundance	15
Fluctuations and Trends	17
Severe Fragmentation	22
Rescue Effect	22
THREATS.....	22
Historical, Long-term, and Continuing Habitat Trends	22
Current and Projected Future Threats	23
Number of Threat Locations	29
PROTECTION, STATUS, AND RECOVERY ACTIVITIES.....	29
Legal Protection and Status.....	29
Non-Legal Status and Ranks.....	29
Land Tenure and Ownership.....	29
INFORMATION SOURCES.....	30

References Cited	30
COLLECTIONS Examined	38
AUTHORITIES CONTACTED	38
ACKNOWLEDGEMENTS	39
BIOGRAPHICAL SUMMARY OF REPORT WRITER(S).....	39

List of Figures

Figure 1. Snowy Owl distribution in Canada and globally. (A) year-round (green); non-breeding (brown; Canada); (B) breeding (red), migration (green: pre-breeding; yellow: post-breeding), and non-breeding (blue) range, Canada and USA (light grey = modelled area, and dark grey = no prediction); and (C) worldwide breeding (yellow) and wintering (blue) range. Sources: BirdLife International (2021) and eBird (Fink <i>et al.</i> 2023). Caution should be taken when interpreting distribution of this species (especially in the Arctic and interior British Columbia) because of the localised distribution of observers, non-systematic survey coverage, and the species' patchy breeding distribution and irruptive movements.....	8
Figure 2. Population trend of Snowy Owl, 1966-2023, calculated from survey-wide Christmas Bird Count abundance data (Canada and USA). Shaded area shows 95% CI. Source: Meehan pers. comm. 2025.....	18
Figure 3. Population trend of Snowy Owl, 1966-2023, calculated from Christmas Bird Count abundance data, Bird Conservation Region 11 (Prairie Potholes). Shaded area shows 95% CI. Source: Meehan pers. comm. 2025.	20
Figure 4. Inter-annual population growth rates (λ) of Snowy Owl combining four long-term monitoring sites worldwide (Wrangel Island, Karupelv Valley, Bylot Island, and Utqiagvik). Inter-annual population growth rate (λ) is the ratio of population size at the end of one interval to population size at the end of the previous interval. The median is depicted with a thick blue solid line, while the 80% and 95% highest density prediction intervals are depicted with medium and thin blue lines, respectively. Predictions from each posterior draw are depicted with gray lines. A horizontal dashed line where $\lambda = 1.0$ depicts a stable population. Source: McCabe <i>et al.</i> 2024.	21

List of Tables

Table 1. Indigenous names for Snowy Owl identified during preparation of this status report (compiled by C. Artuso and G. Goulet).....	5
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List of Appendices

Appendix 1. Threats calculator for Snowy Owl (<i>Bubo scandiacus</i>)	40
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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Current classification:

Class: Aves

Order: Strigiformes

Family: Strigidae

Genus: *Bubo*

Species: *B. scandiacus*

Subspecies in Canada:

None

Taxonomic changes since previous report (for reassessments):

Snowy Owl was formerly known as *Nyctea scandiaca*.

Common names:

English: Snowy Owl

French: Harfang des neiges

Sample of Indigenous names/dialects; Snowy Owl is recognized by many Indigenous Nations who identify the species within their distinct language/dialect, and this should not be considered a comprehensive list of names/dialects. See Table 1 for additional Indigenous names identified during preparation of this status report:

Inuktitut: Ookpik/ Ukpik/ Uppik/ Aukpik/ Ukpikjuaq/ Upialuk

Innu Aimun: uapikunu/uapakanu/waapikiyuw

Dëne Sųłíné: yélaba

Vuntut Gwich'in: vihsaiivee/ visàiidavee

Cree: Wapacathew Omissew

Synonyms and notes:

Formerly classified as the sole member of the genus *Nyctea*, mtDNA cytochrome b sequence data have shown that Snowy Owl is very closely related to the eagle-owls or horned owls in the genus *Bubo* (Wink and Heidrich 2000; Penhallurick 2002).

Table 1. Indigenous names for Snowy Owl identified during preparation of this status report (compiled by C. Artuso and G. Goulet).

Language name	Species Name	Source	Identified within the ATK Source Report (ATK SC 2024)
Inuktitut ᐃᓄᐅᐅᐅᐅ	uppiᓯ ᐅᐅᐅᐅ, ukpiᓯ ᐅᐅᐅᐅ, ukpiᓯᓄᓄᓄᓄ ᐅᐅᐅᐅᐅᐅᐅᐅᐅᐅ, aukpiᓯ ᐅᐅᐅᐅᐅᐅ	SIKU (https://siku.org) , Glosbe (https://glosbe.com) , Nunavut Wildlife Resource and Habitat Values (2)	Ukpiᓯᓄᓄᓄᓄ; Ukpiᓯᓄᓄᓄᓄ; Upialuk (Inuktitut)
Dēne Sųlīné (Dene, Chipweyan)	yélaba	Dēne Dēdlīné Yatié ʔerehtl'ischo (Chipweyan Dictionary)	
Déljine (Northern Slavey)	béhdjga	Slavey dictionaries, Sahtú ot'jine Dictionary Déljine Kádá (https://www.sahtudec.ca/documents/slavey-dictionaries)	
Dene Yatié (Southern Slavey)	mehddhî dek'ali	South Slavey Topical Dictionary Kátâ'odehche Dialect http://ssdec.nt.ca/Dictionary/dictionary.pdf	
Southern Tutchone	máddhî dāgay	Southern Tutchone Noun Dictionary, https://ynlc.ca	
Nēhiyawēwin / Nēhinawēwin / Nīhithawīwin / Ililimowin (Cree)	wāpōhow, wāpōhotu, wāpōkētō, wāpākāthow; wāpikalow	Arok Wolvengrey & Jean Okimāsis <i>in</i> Houston <i>et al.</i> Eighteenth Century Naturalists of Hudson Bay (other names specific to male and female Snowy Owls also given); Moose Cree Dictionary https://moosecree.ca/dictionary/	Wapacathew Omissew (Cree)
Innu (Innu Aimun, Naskapi)	uapakanu, waapikiyuw (Naskapi)	https://dictionary.innu-aimun.ca/Words , Freelang.net	Uapikunu (Innu)
Nehirāmowin (Atikamekw)	wapakoro, wapahowisiw	dictionnaire Atikamekw, https://dictionnaire.atikamekw.atlas-ling.ca	
Anishinaabemowin (Ojibwe)	waabigookooko'oo (Ojibwe), waab-gookook'oonh (Odawa)	Binesi-dibaajimowinan, Freelang.net, Odawa & Eastern Ojibwe online dictionary (https://dictionary.nishnaabemwin.atlas-ling.ca , editors Editors: Mary Ann Naokwegijig-Corbiere and Rand Valentine)	
Siksikáí'powahsin (Blackfoot)	aapsspisttoo	https://dictionary.blackfoot.atlas-ling.ca	
Peskotomuhkati-Wolastoqey (Passamaquoddy & Maliseet)	wapi-kuhkukhahs	Peskotomuhkati-Wolastoqey Language Portal, https://pmportal.org/	
Vuntut Gwich'in	visàiidavee	https://firstvoices.com	Vihsaiivee (Gwich'in)
Haida	kuyánhl	Dictionary of Alaskan Haida (https://sealaskaheritage.org/wp-content/uploads/2024/03/Haida_dictionary_we_b.pdf)	
Kanien'kéha (Mohawk)	thoniéntate	Kanienkeha glossary (category: birds)	
Ktunaxa	nuqʔunkupi	https://firstvoices.com	
Stz'uminus & HUL'Q'UMI'NUM'	muqmeqe'	https://firstvoices.com (same word given for both languages)	
SENĆOŦEN	MEᑭ,MEᑭ,E	https://firstvoices.com	
Hlgaagilda X̣aayda Kil	sahkunhlaay	https://firstvoices.com	
Secwepemc	skikyéy	https://firstvoices.com	
Tsilhqot'in (Xeni Gwet'in)	ʔenaqox nisdžun	https://firstvoices.com	

Description of Wildlife Species

A large white owl with yellow eyes, Snowy Owl is unique in appearance and one of the most recognizable birds in the world. This highly mobile species shows irruptive patterns of abundance (i.e., large-scale irregular movements related to food availability) with large numbers of individuals invading and deserting an area according to fluctuations in availability of lemmings (*Lemmus* and *Dicrostonyx* spp.; Therrien *et al.* 2014a). Snowy Owls are well known as 'white owls' by Aklavik hunters (Wildlife Management Advisory Council North Slope 2003).

Designatable Units

Recognized subspecies or varieties in Canada:

Only one population worldwide. See Population Structure, below.

Designatable Units:

As there are no discrete subpopulations or subspecies in Canada, nor evidence of evolutionary divergence by any part of the Canadian population, Snowy Owl is treated here as a single designatable unit.

Special Significance

Given the extent of its breeding range in the High Arctic tundra and Canada's Arctic land mass, the core population of Snowy Owl worldwide seems to reside and nest in the Canadian archipelago, suggesting a high Canadian responsibility for the species. With expected/projected changes in the tundra biome in the coming decades (IPCC 2021) and with the extent of tundra ecosystems shrinking through the shrubification process (i.e., advancing shrubline in response to climate warming; Davis *et al.* 2021; Mekonnen *et al.* 2021), Canada may become the only country harbouring a significant expanse of land suitable for breeding in this species; most tundra habitat in Russia lies in the low Arctic, which is currently more vulnerable to climate change and shrubification.

Snowy Owl plays a major ecological role in tundra ecosystems, by helping to limit herbivore (mostly lemmings) numbers and by dispersing and irrupting where these small mammals occur at high abundance (Therrien *et al.* 2014a). It is an important indicator species, providing information about the fluctuations in lemmings and tundra ecosystems in general.

As a mostly non-harvested species, Snowy Owl nonetheless has economic significance for tourism, birdwatching, and the wilderness of the tundra (and temperate) regions in Canada. It has a huge cultural significance, being Quebec's provincial bird and a recognized icon across Canada. A public favourite, Snowy Owl receives recurrent attention in magazines, newspapers, social media, and websites.

ABORIGINAL (INDIGENOUS) KNOWLEDGE

Aboriginal Traditional Knowledge (ATK) is relationship-based. It involves information on ecological relationships between humans and their environment, including characteristics of species, habitats, and locations. Laws and protocols for human relationships with the environment are passed on through teachings and stories, and Indigenous languages, and can be based on long-term observations. Place names provide information about harvesting areas, ecological processes, spiritual significance or the products of harvest. ATK can identify life history characteristics of a species or distinct differences between similar species.

Cultural Significance to Indigenous Peoples

This species is culturally significant to Indigenous peoples who hold detailed knowledge on the evolving, dynamic nature of the species. Indigenous peoples also carry many legends including Ookpik (Snowy Owl) and its interactions with other wildlife species from the Arctic. Wildlife Management Boards across the Canadian Arctic were contacted for information, but did not have information to share on this species.

The Inuvialuit of the western Arctic have been hunting and travelling in the mountains, waterways, and coastal plains for centuries and are very familiar with Snowy Owl behavior and changes over time in distribution, occurrence, and abundance (Wildlife Management Advisory Council North Slope 2003). In the past (~ eight decades ago), Snowy Owl were hunted during the fall by Inuvialuit for special meals (Wildlife Management Advisory Council North Slope 2003). On the Belcher Islands Snowy Owl skins were used to make warm, durable parkas for children (Nakashima 1991). ATK on current harvesting of Snowy Owl by Indigenous peoples was not available. In the past, on the Yukon North Slope, Inuvialuit would opportunistically harvest Snowy Owl for food if needed (Wildlife Management Advisory Council North Slope pers. comm. 2025).

DISTRIBUTION

Global Range

Snowy Owl nests across the circumpolar north where tundra ecosystems are present (Greenland, Norway, Finland, Russia, Sweden, USA (Alaska), and Canada; Figure 1). While breeding is limited to tundra ecosystems, during the non-breeding season in Snowy Owl occurs in every province and territory in Canada, and south into the continental USA and, occasionally, far-flung sites such as Bermuda and the Azores. Given the significant extent of tundra ecosystems in the Canadian Arctic compared with the rest of the circumpolar region, Canada has significant responsibility for the species' conservation. Although information is lacking for Russia, it has the potential for a population that is nearly as large as Canada's (Gauthier pers. comm. 2024; but see Special Significance, above).

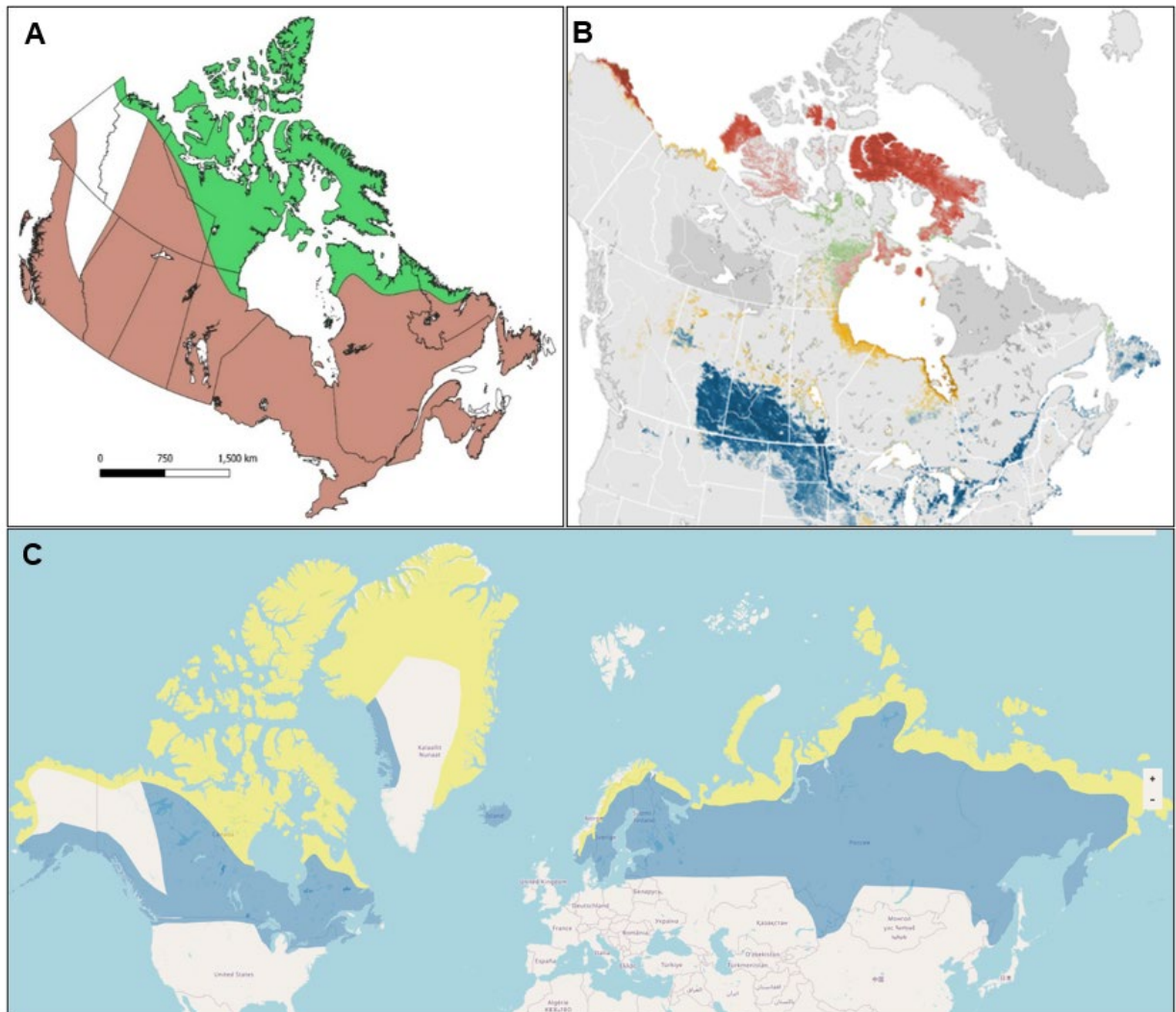


Figure 1. Snowy Owl distribution in Canada and globally. (A) year-round (green); non-breeding (brown; Canada); (B) breeding (red), migration (green: pre-breeding; yellow: post-breeding), and non-breeding (blue) range, Canada and USA (light grey = modelled area, and dark grey = no prediction); and (C) worldwide breeding (yellow) and wintering (blue) range. Sources: BirdLife International (2021) and eBird (Fink *et al.* 2023). Caution should be taken when interpreting distribution of this species (especially in the Arctic and interior British Columbia) because of the localised distribution of observers, non-systematic survey coverage, and the species' patchy breeding distribution and irruptive movements.

Canadian Range

In Canada, Snowy Owl breeding sites and densities are irregular across tundra ecosystems in Yukon, Northwest Territories, Nunavut (from the Belcher Islands to Alert), northern Québec, and Labrador (Nunavik; Figure 1). In Yukon, Herschel Island is the only locality where the species regularly occurs year-round, and is the only site where breeding has been documented (Bennett pers. comm. 2025). Occasional breeding has also been confirmed in northern Manitoba and is suspected in Ontario. Although the species occurs in

remote areas during the breeding season, its range is relatively well-understood. About 90 to 95% of the North American distribution and breeding population occurs in Canada, based on the extent of tundra habitat across Canada and Alaska (Slaymaker *et al.* 2023).

The species spends the non-breeding season (October – April) in the Arctic and boreal regions of Nunavut, Northwest Territories, Yukon, and northern Québec, mostly in coastal environments and on the sea ice (Therrien *et al.* 2011; Robillard *et al.* 2018), as well as in open areas south of the boreal forest across Canada (Kerlinger *et al.* 1985; Robillard *et al.* 2016; Therrien *et al.* 2017; Chang and Wiebe 2018; Figure 1).

Inuit and Inuvialuit interviewees, who participate in land-based activities, generally attributed Snowy Owl occurrence, abundance and nesting to the cyclical presence and abundance of lemming and ground squirrel (*Urocitellus parryii*) prey (Wildlife Management Advisory Council North Slope 2003; Nunavut Coastal Resource Inventory 2007-2015). Snowy Owl was seen more often on Herschel Island between late June-early July, the only locality where Snowy Owl was reported by different hunters to be abundant during some summers (30-50 owls, 100 owls; Wildlife Management Advisory Council North Slope 2003). Snowy Owl was rarely observed on coastal flats and the delta during winter, April, and September (Wildlife Management Advisory Council North Slope 2003).

Population Structure

Two independent genetic studies reported no genetic structure across the Snowy Owl population worldwide (Marthinsen *et al.* 2009; Gousy-Leblanc *et al.* 2023). The species' broad annual dispersal and high mobility seem to allow for mixing of individuals.

Extent of Occurrence and Area of Occupancy

Current EOO:

Extent of occurrence (EOO) within Canada is 12,401,744 km², based on occurrences entered into the eBird database (Ethier pers. comm. 2024), and is thus above the threshold for an assessment of Threatened under COSEWIC quantitative Criterion B1.

Current area of occupancy and IAO:

The index of area of occupancy (IAO) is at least 4,092 km², based on breeding season occurrences in the eBird database (Ethier pers. comm. 2024), and is thus above the threshold for an assessment of Threatened under COSEWIC quantitative Criterion B2.

Fluctuations and Trends in Distribution

Whether there has been a decline in EOO is unknown, but current or future declines are suspected or projected given that tundra ecosystems are being converted through shrubification (see **Historical, Long-term, and Continuing Habitat Trends**, below). Based on population declines (see below), it can be inferred that IAO is declining.

Inuit members of Kanngiqtugaapik and Pangniqtuuq communities, located on the eastern coast of Baffin Island, NU, interviewed during 2016-2017, reported that Snowy Owl, along with Canada Goose (*Branta canadensis*) and Arctic Tern (*Sterna paradisaea*), were observed less often than before “[The birds are] probably changing their routes because it’s getting too warm, they’re going to the cold climate.” (Inuit adult from Pangniqtuuq; Sansoulet *et al.* 2020).

BIOLOGY AND HABITAT USE

Life Cycle and Reproduction

Snowy Owl reaches sexual maturity as early as 2 years of age, although average age of first breeding is around 4 years; average generation time is estimated at 8 years (Bird *et al.* 2020; McCabe *et al.* 2024). The species has a high fecundity rate (average clutch size = 7 eggs; Therrien *et al.* 2015a; Holt *et al.* 2020). First year survival in the sub-boreal range is density-dependent, being much lower during irruption years (~50%) than non-irruption years (>95%; McCabe *et al.* 2021). Annual adult survival rate is high (between 85 and 93%; Therrien *et al.* 2012; McCabe *et al.* 2021). Given the long distances and various geographic orientations taken during annual dispersal movements (Therrien *et al.* 2014; Robillard *et al.* 2018), it seems unlikely that pair members are faithful to each other in consecutive years, but actual rate of mate retention is unknown. However, within a given breeding season, pairs seem to be monogamous (Holt *et al.* 2020).

Although some individuals are present in the breeding range year-round, birds that move out of the tundra come back and settle to breed from late April to early June. Snowy Owl usually starts laying eggs around mid-May (range = 8 May – 6 June; Therrien *et al.* 2015a). Eggs are usually laid every other day. Incubation is only done by the female, starts with the first egg, and lasts approximately 32 days. The semi-altricial chicks hatch asynchronously and are brooded for at least 10 days. Hatching occurs throughout June up until mid-July. Individually tracked adult breeders usually start dispersing from their nesting sites in August and September (Therrien *et al.* 2012). Nesting activity was reported by Inuit from Nunavut to be dependent upon cyclical prey (Nunavut Coastal Resource Inventory 2007-2015). Community members from Kugaaruk and Taloyoak observed Snowy Owl nursery areas with three small Ukpik at one location (Nunavut Coastal Resource Inventory 2007-2015).

An ongoing medium-term (1993-present) research project on Bylot Island, Nunavut (73° N, 80° W) reports an average start of laying around 20 May, an average clutch size of 7.1, and a mean probability of at least one chick leaving the nest of 96% over a 25-year period (Therrien *et al.* 2015a).

Habitat Requirements

Snowy Owl uses a variety of habitats throughout its annual cycle. During the breeding season, the species will typically nest in mesic to dry tundra habitats (Holt *et al.* 2020). It can nonetheless use any habitat where its main prey, lemmings, are abundant, including near wetlands, rivers, lakes, and glacial moraines (Therrien *et al.* 2015a). During the non-breeding period, Snowy Owl can be found inland in the same type of tundra habitats used during the breeding season, but will often be seen near the coastline or on the sea-ice relatively far from the coast (>10 km, including use of polynyas for hunting sea ducks) especially in eastern Nunavut (Therrien *et al.* 2011; Robillard *et al.* 2018). It also spends a significant amount of time in agricultural lands (Chang and Wiebe 2016, 2018) during the non-breeding season. See also Canadian Range, above.

ATK reports that Snowy Owl nests along coastal plains, well-vegetated outwash plains, patchy, well vegetated lowlands associated with small tundra lakes and ponds, and on the tops of little hills and high cliffs in Nunavut (Nunavut Coastal Resource Inventory 2007-2015). In the Cambridge Bay region Snowy Owl nests anywhere “except near the town” (Nunavut Coastal Resource Inventory 2007-2015: Cambridge Bay 2015).

In Labrador, Innu observed Snowy Owl at the mouth of Tepiteu-shipu, an area “where there is always [Canada] geese” (Armitage 2007). The area has “lots of willows”, muddy flats, grassy areas, barren hills, and marshes with small ponds (Armitage 2007).

Within the Inuvialuit Settlement Region, Snowy Owl is commonly observed all over the flats and near willows, perched on knolls, and along riverbanks in the Delta during September (Wildlife Management Advisory Council North Slope 2003). Snowy Owl is rarely observed in the delta during winter, but when seen, they are often sitting on hummocks overlooking open areas (Wildlife Management Advisory Council North Slope 2003). They are observed almost every month of the year near large lakes “on the flats” near the coast (Wildlife Management Advisory Council North Slope 2003).

Inuit from Belcher Islands observe Snowy Owl at open water areas (Gilchrist and Roberston 2000). Snowy Owl winters near the Agiaraaluk polynyas (Nakashima 1990).

Movements, Migration, and Dispersal

Dispersal movements and breeding distribution are affected by the abundance of its main prey, lemmings (Therrien *et al.* 2014a). A partial, irruptive migrant, Snowy Owl generally does not follow specific migration routes over consecutive years, but rather moves according to prey availability (Therrien *et al.* 2014b, 2015b). Nonetheless, the species tends to use similar wintering habitats (regional philopatry) over consecutive winters (Robillard *et al.* 2018; Wiebe *et al.* 2023). Timing of migration is provided above in Life Cycle and Reproduction.

The most dramatic aspect of Snowy Owl behaviour is undoubtedly the scale of its annual breeding dispersal. In spring, individuals can cover 2000 km or more in search of an area harbouring high lemming numbers in order to settle and breed (Therrien *et al.* 2014a). The annual breeding dispersal distance (more than 700 km on average; Therrien *et al.* 2014a; Robillard *et al.* 2018) probably makes Snowy Owl one of the most consistently nomadic terrestrial bird species on the planet. This strategy is responsible for the spectacular breeding and wintering irruptions seen across its range, when in a given year individuals invade a region outside their regular wintering range, sometimes as far south as Bermuda and Florida (eBird 2021), but are seldom seen in subsequent years (Robillard *et al.* 2016). This behaviour is responsible for the challenges associated with conducting detailed population monitoring at any given site (see **Population Sizes and Trends**, below). Very low breeding site fidelity has been recorded between years. Indeed, adult telemetry-tracked Snowy Owl females seldom returned to any former nesting site over four consecutive years (Therrien *et al.* 2014a).

Overall, as seen in some other irruptive species (Runge *et al.* 2014), the range of occurrence for breeding could be relatively constant across years, although the location of particular breeding areas could be highly dynamic.

Interspecific Interactions

Diet

Known as a small mammal (rodent) specialist, especially during the breeding season when >95% of its diet consists of lemmings, with an occasional ermine or stoat (*Mustela* spp.) or Arctic Fox (*Vulpes lagopus*) cub, or birds, such as Lapland Longspur (*Calcarius lapponicus*) or Snow Goose (*Anser caerulescens*; Therrien *et al.* 2015a). Snowy Owl switches from a diet almost entirely made of small mammals during the breeding season (Therrien *et al.* 2015a) to a much more diversified diet ranging from small mammals to waterbirds during the non-breeding season, when individuals often spend several months out on the sea-ice, along the coast, or riding ice floes on the Great Lakes. Smith (1997) also reports a surprisingly wide diversity of prey items, including large items, such as a Great Blue Heron (*Ardea herodias*).

Inuvialuit report that Snowy Owl hunt lemmings and ptarmigan (*Lagopus* spp.) (Wildlife Management Advisory Council North Slope 2003), and Inuit from Nunavut report Snowy Owl is dependent upon cyclical prey (Nunavut Coastal Resource Inventory 2007-2015). Inuit in Belcher Islands observed Snowy Owl taking adult eider (*Somateria mollissima*) on ice edges, at night, during winter months when other prey are not available (Nakashima 1990; Gilchrist and Robertson 2000), and taking adult, young, male and female eiders, and crippled ducks from open water areas (Robertson and Gilchrist 2003). Long-tailed Ducks (*Clangula hyemalis*) were also taken by Snowy Owl (Robertson and Gilchrist 2003). Innu from Labrador report that Snowy Owl ...”eat snowshoe hare (*Lepus americanus*), partridge (Tetraonidae), porcupine (*Erethizon dorsatum*) and mice. Not fish” (Armitage 2007).

Predators and competitors:

In recent history, humans have probably constituted the main predatory threat to Snowy Owl on its breeding grounds, with Wolf (*Canis lupus*) ranking second. Arctic and Red Fox (*V. vulpes*), ermine, Rough-legged Hawk (*Buteo lagopus*), Gyrfalcon (*Falco rusticolus*), Glaucous Gull (*Larus hyperboreus*), Long-tailed Jaeger (*Stercorarius longicaudus*), Parasitic Jaeger (*S. parasiticus*) and Pomarine Jaeger (*S. pomarinus*), and Common Raven (*Corvus corax*) all compete with Snowy Owl for food and space, although Snowy Owl seems dominant for most of these interactions (Seyer *et al.* 2020). A member of the Innu Traditional Knowledge Committee reported they once killed a uapikunu (Snowy Owl) at Tepiteu-shipu (Armitage 2007). Snowy Owl was previously hunted by northern Indigenous people for food (Wildlife Management Advisory Council North Slope 2003) and to construct clothing (Nakashami 1991). On the non-breeding grounds, Snowy Owl habitat selection could be affected by a similar sized competitor, Great Horned Owl (*Bubo virginianus*; Chang and Wiebe 2018).

Host/parasite/disease interactions:

There are recent records of Snowy Owl mortality caused by Highly Pathogenic Avian Influenza (HPAI; Canadian Wildlife Health Cooperative 2025; Fitzgerald pers. comm. 2023; CBC News 2025). There has been a recent increase in nest failures caused by blackflies (family Simuliidae) in the southern portion of Snowy Owl range in Eurasia (Solheim *et al.* 2013). Biting insects, including blackflies, also transmit avian trypanosomes (unicellular blood parasites); this interaction is not known in wild Snowy Owls, but has been documented for captive individuals (Baker *et al.* 2018), and other northern raptor species (Kazak *et al.* 2023). See also Current and Projected Future Threats, below.

Physiological, Behavioural, and Other Adaptations

High mobility and potential for long-distance dispersal allow this species to move in search of favourable conditions. Its diverse diet during the non-breeding season allows the species to survive in various situations, although its large dependance on lemmings for breeding (95% of breeding season diet) makes Snowy Owl vulnerable to a reduction in such prey (Schmidt *et al.* 2012). To raise a clutch successfully, Snowy Owl needs at least 2.5 lemmings/ha, a density that occurs under good conditions (Gilg *et al.* 2006; Therrien *et al.* 2014a). Inuvialuit report that Snowy Owl '.... Might mate but not raise young in low lemming cycles' (Wildlife Management Advisory Council North Slope 2003).

Limiting Factors

Limiting factors are generally not human-induced and include intrinsic characteristics that make the species less likely to respond to conservation efforts. Limiting factors may become threats if they result in population decline. The high dependence on lemmings for successful reproduction limits Snowy Owl (Schmidt *et al.* 2012; Therrien *et al.* 2014b). Moreover, and similar to most raptor species (Newton *et al.* 2016), Snowy Owl has low juvenile survival (68%), caused by the challenges associated with acquiring the skills to find

and capture suitable prey after independence from parents, and with defending a territory (Chang and Wiebe 2016; McCabe *et al.* 2021). In particular, high reproduction during peak lemming years creates a “doomed surplus” of young due to low subsequent survival, resulting in density-dependent population limitation (McCabe *et al.* 2021).

POPULATION SIZES AND TRENDS

Data Sources, Methodologies, and Uncertainties

The nomadic and irruptive nature of Snowy Owl makes it challenging to obtain reliable population estimates of breeding individuals using traditional methods (e.g., nest search, abundance surveys), but recent advances in genetic analyses (e.g., single-nucleotide polymorphism (SNP) analyses) can help in assessing effective population size and trend (Gousy-Leblanc *et al.* 2023). In the past, Snowy Owl subpopulations have been estimated using nest density in a given region, a value that was then extrapolated to the whole Arctic (Rich *et al.* 2004). Given the nomadic and irruptive behavioural characteristic of the species, it is now known this approach provides a gross over-estimation (Rich *et al.* 2004). The size of Canada’s Snowy Owl population remains very hard to estimate precisely because of the species’ irruptive behaviour (see Runge *et al.* 2014 for details on irruptive species assessments) and the annual long distance dispersal movements of individuals. However, recent, more accurate estimates, suggest a much lower global population than previously thought (BirdLife International 2021).

The varying nature of its numbers over space and time also adds uncertainty to estimates of the rate of change in the Canadian and worldwide populations. Nonetheless, data from the North American Christmas Bird Count (CBC), a long-term citizen science monitoring program for Canada and the US, are suitable for capturing trends in the southernmost portion of the non-breeding population (Robillard *et al.* 2016) and representing the Canadian population, as most of the Snowy Owls in North America breed in Canada (Therrien *et al.* 2014a; Wiebe *et al.* 2023; see Canadian Range, above). CBC counts are corrected for an increase in number of surveyors over time, but for highly-sought and visible species such as Snowy Owl, where the annual detections have likely not increased in parallel with number of observers, an inappropriately high correction factor would create an apparent but false decrease in counted individuals. Thus, it should be noted that analysis of CBC data uses a flexible effort correction function that can be nearly flat where the data support it. This is the case with Snowy Owl, meaning that effort-correction should not impair trend reliability (Meehan pers. comm. 2024). For this species, the reliability of the analysis is nonetheless considered Medium given CBC’s incompletely-standardized methods and the irruptive nature of the species (Environment and Climate Change Canada 2019). Because it is conducted around Christmastime and across the southern portion of the country, the CBC mostly monitors wintering and dispersing juveniles (which are more prone to winter south of the boreal forest than adults). Southeastern Canada seems to host a disproportionate number of juveniles, while in Prairie provinces the high proportion of adults seems more consistent year to year (Santonja *et al.* 2019) and trends there may be more representative of those for adult birds alone.

The database provided by eBird (2021), in which naturalists worldwide enter records of birds they have seen or heard, has recently grown exponentially. As a distinctive and sought-after species by birders, Snowy Owl is unlikely to be misidentified; nonetheless, anomalous observations submitted to the eBird database are reviewed by local moderators to ensure data integrity. Recent analyses of trends in cumulative change of estimated relative abundance have been generated from these datasets for a range of species, including Snowy Owl (Fink *et al.* 2023).

Long-term monitoring studies on the breeding grounds are extremely rare and only one such study is known to exist in Canada (Gauthier *et al.* 2024a). Other projects varying in duration and range are located in Greenland (Gilg *et al.* 2006), Alaska (Holt pers. comm. 2023) and Wrangel Island in Russia (Menyushina pers. comm. 2023). Because of their annual long-distance breeding dispersal, these other sites harbour high importance for Snowy Owl globally, so population trend analysis may also benefit from considering sites outside of Canada.

Abundance

Snowy Owl was reported to be abundant in the southwest portion of Bylot Island (Nunavut Coastal Resource Inventory 2007-2015: Arctic Bay 2010).

Snowy Owl abundance on Herschel Island was described as generally rare and variable between and within years and summers, with not much change over time. (Wildlife Management Advisory Council North Slope 2003). Abundance was also reported as rare and variable in winter, in the Delta (Wildlife Management Advisory Council North Slope 2003).

Ongoing long-term Arctic breeding surveys and genetic studies suggest the world population of Snowy Owl is most likely much lower than previously estimated. Previous population estimates, which were as high as 290,000 individuals worldwide (Rich *et al.* 2004; BirdLife International 2004, cited in Holt *et al.* 2020), relied on a misconception that Snowy Owl breeds regularly across the whole of its breeding-season distribution. Other regions throughout the circumpolar Arctic (e.g., inland Greenland, several islands in Nunavut, Canada) are ice-covered or without known lemming populations, suggesting a smaller breeding range than historically presented. These early estimates therefore grossly overestimated population size (Rich *et al.* 2004; see Potapov and Sale 2012). An updated range map depicting the boundary of Snowy Owl range across breeding, non-breeding, and pre- and post- breeding migratory seasons in North America portrays a more fragmented and restricted range than that shown in historical range maps (Figure 1B; Fink *et al.* 2023).

Various approaches have been suggested in the last decade to improve estimates of Snowy Owl population size. Potapov and Sale (2012) estimated the probability of aggregations of Snowy Owls in a particular area and integrated this spatial probability for the entire range. This approach used historical breeding data from the literature, continental transects and aerial surveys, migration patterns, and observations reported by the Arctic Wader Study Group, and the authors estimated 14,000 pairs (28,000 mature individuals) of Snowy Owl worldwide. Considering that the total global population can fluctuate with good or poor breeding conditions depending on the year, Potapov and Sale (2012) suggested that a more conservative global population estimate would be half of that estimate (7,000–8,000 pairs, or 14,000–16,000 mature individuals). However, many assumptions behind this approach (e.g., size and number of individual aggregations) remain vague and untested.

An alternative estimation approach has been to calculate a theoretical carrying capacity of the tundra habitat for breeding owls. Walker *et al.* (2005) estimated the size of the non-glaciated Arctic tundra biome at 5,000,000 km². If it is assumed (1) that only 20% of this area is suitable for Snowy Owl nesting, a conservative estimate excluding glaciers, lakes, ponds, and cliffs (as seen on long-term study sites; Gauthier *et al.* 2024a); and (2) that (most) owls breed only in peak lemming years, which have a typical recurrence of four years (Ehrich *et al.* 2020), this means that about 250,000 km² of Arctic tundra may offer suitable breeding conditions for Snowy Owl every year. Finally, using a mean density of 0.1 ± 0.02 pair/km² in good breeding years (Gilg *et al.* 2006; Therrien *et al.* 2014b), the highest plausible estimate of breeding pairs could be 25,000 annually worldwide (Gauthier pers. comm. 2023).

Genetic analyses have provided information on the effective population size (N_e) of Snowy Owl. Marthinsen *et al.* (2009) analysed mitochondrial DNA from Snowy Owls from North America, Fennoscandia, and eastern Russian and found no phylogeographic genetic structure, suggesting a single panmictic population with unrestricted exchange of genetic material over multiple generations – although these authors note that it is difficult to tell whether gene flow is current or historical. Based on this analysis, these authors also estimated the maximum effective population at 14,000 adult females worldwide. More recently, Gousy-Leblanc *et al.* (2023) investigated genetic differentiation using SNP-based analyses of owls sampled from across North America and found high genetic intermixing, thus also indicating a single Snowy Owl population within the continent. Based on this analysis, they estimated the North American effective population to be 15,792 individuals (95% CI: 10,850–28,950) in 2018, and calculated the N_e / N_c ratio to be ~0.57–1.05 (where N_c is the census-based population size; Gousy-Leblanc *et al.* 2023).

Finally, the most recent Partners in Flight estimate puts the North American population at 15,000 breeding individuals (Partners in Flight 2025). Thus, based on several lines of evidence, and recognizing that Canada harbours approximately 90 to 95% of the North American breeding population (see Canadian Range, above), the Canadian population of Snowy Owl is estimated at between 13,000 and 16,000 mature individuals.

Fluctuations and Trends

Continuing decline¹ in number of mature individuals:

Snowy Owl is being observed less on the Yukon coast in recent years, possibly due to hot and dry conditions along the coast influencing habitat use by both owls and their prey species, and/or the increasing presence of other large birds such as ravens, eagles, and falcons (Wildlife Management Advisory Council North Slope pers. comm. 2025).

Snowy Owl is categorized as Vulnerable on the International Union for Conservation of Nature (IUCN) global Red List, due to population declines reported in North America and likely in Europe and Russia (BirdLife International 2021). CBC data for birds outside the breeding season south of the boreal forest in Canada and the US show a long-term (1966-2023) decline of 2.3% annually (also see *Long-term trends*, below); interpolating this trend provides a 3-generation trend estimate of -42.6% (95% CIs: -58.1, -30.4; Meehan pers. comm. 2025). Note that for widely fluctuating or irruptive species such as Snowy Owl, interpolating a 3-generation trend using long-term data is the appropriate approach for calculating a population reduction because it is likely a more representative estimate of the long-term trend (Porszt *et al.* 2012; IUCN Standards and Petitions Committee 2024; Figure 2).

¹ A recent, current, or projected future decline (which may be smooth, irregular or sporadic), which is liable to continue unless remedial measures are taken. Fluctuations will not normally count as continuing declines.

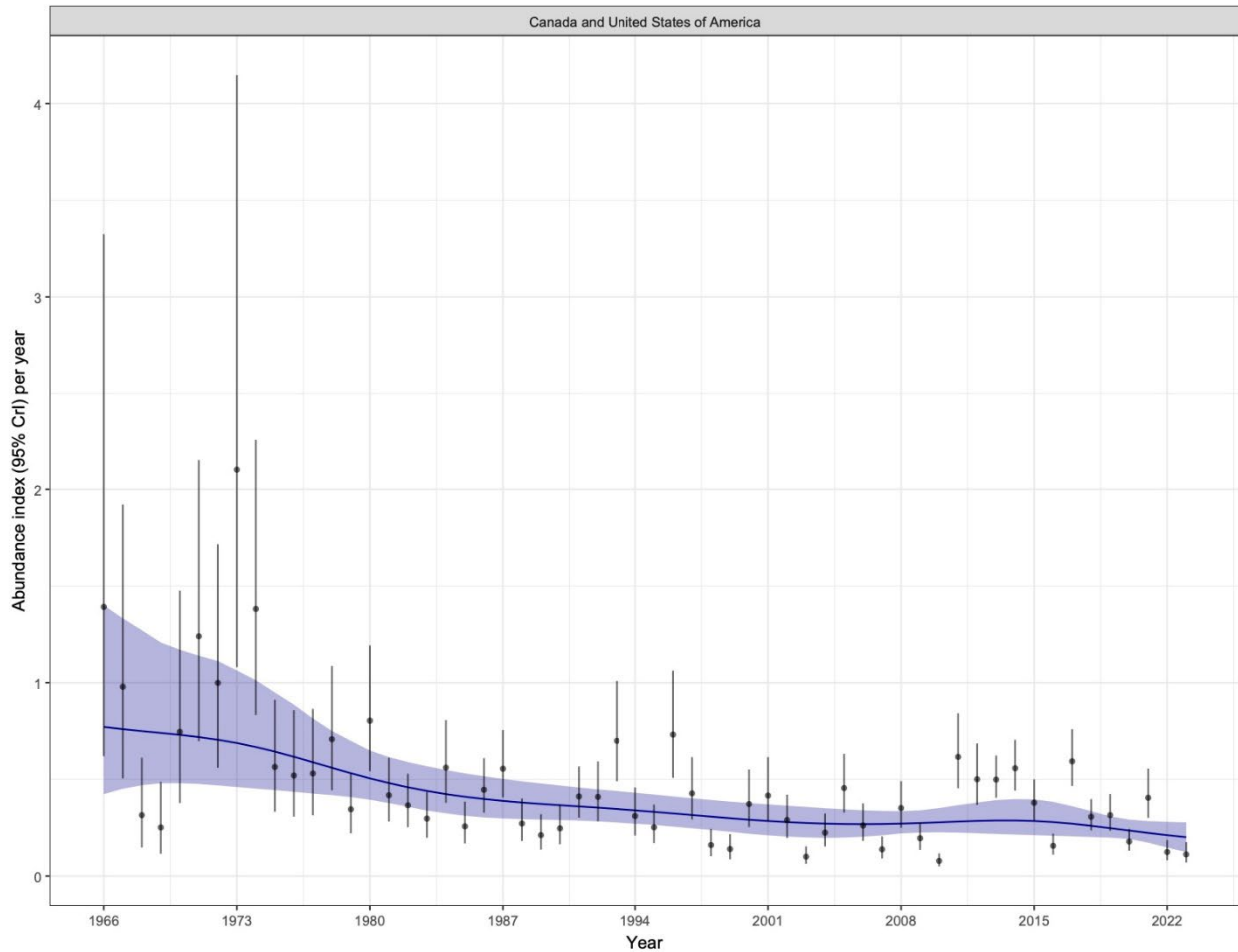


Figure 2. Population trend of Snowy Owl, 1966-2023, calculated from survey-wide Christmas Bird Count abundance data (Canada and USA). Shaded area shows 95% CI. Source: Meehan pers. comm. 2025.

Evidence for continuing decline (1 generation or 3 years, whichever is longer, usually up to 100 years):

The mean short-term CBC trend for North America (2013-2023, or approximately 1 generation) is estimated to be -3.5% annually (95% CI: -9.4, -0.5; median trend -1.8%) for a change over that time period of -16.3% (95% CI: -62.8, -4.7; Meehan pers. comm. 2025). A 10-year trend analysis using citizen science observations recorded in eBird suggests a decline of 51.8% (80% CI: -55.6%, -44.4%) during the non-breeding season from 2011 to 2021 (13 Dec–1 March, North America-wide data; Fink *et al.* 2023). Canadian changes for that period using eBird data are similar to those for North America: -49.8% (80% CI: -54.8, -40.1; Fink *et al.* 2023). It should be noted that short-term trends for a fluctuating species may be less informative than long-term trends.

A recent study on lemming fluctuations (Gauthier *et al.* 2024b) suggests that there is presently no Arctic-wide collapse of lemming cycles as suggested elsewhere (e.g., Ims *et al.* 2008, 2011; Kausrud *et al.* 2008; Gilg *et al.* 2009). Nonetheless, Gauthier *et al.* (2024b) did find a negative effect of warm spells during snow onset on lemming abundance the following year, and report that lemming population cycles have been sporadic at most sites during the last decades and that continued warming in early winter may decrease the frequency of periodic irruptions with negative consequences for tundra ecosystems. This phenomenon includes the tundra biome in Canada.

Evidence for past decline (3 generations or 10 years, whichever is longer) that has either ceased or is continuing:

Interpolation of long-term (1966-2023) data from the Christmas Bird Count indicate an ongoing 3-generation decline of 42.6% (Meehan pers. comm. 2025); see *Continuing decline in number of mature individuals*, above. As noted above (see Data Sources, Methodologies, and Uncertainties), southeast Canada hosts a disproportionate number of wintering immature owls while a high proportion of adults is consistently observed in the Prairie region; thus, trends for the North American Prairies may be more representative of the adult portion of the Snowy Owl population. The long-term trend for the Prairie Potholes (Bird Conservation Region 11) is -2.0 (-2.9, -1.3), providing a 3-generation interpolated trend there of -38.90% (-50.4, -27.0; Meehan pers. comm. 2025; Figure 3).

McCabe *et al.* (2024) estimated worldwide population trends from counts of active nests within equal areas at four sites (Bylot Island in Nunavut Canada, Karupelv Valley in Greenland, Utqiagvik in Alaska, and Wrangel Island in Russia) monitored from 1988–2020. They used a Bayesian hierarchical generalized linear model that weighted the contribution of each site proportional to average counts at that site, and yielded an inter-annual population growth rate (λ), which is the ratio of population size at the end of one interval to population size at the end of the previous interval (e.g., for a stable population $\lambda=1$, i.e., growth rate of 0). Here λ is reported for three generations, and uncertainty in the estimate is expressed as the high density interval (HDI), which is roughly equivalent to a credible interval (see McClure *et al.* 2023 for details). They converted inter-annual population growth rates to percent change over three generations (i.e., 24 years; Bird *et al.* 2020) and designated the probability of decline (hereafter ‘pd’) to indicate a negative trend when $\text{pd} > 0.90$.

Inter-annual population growth rates averaged over the entire survey period (1988–2020) suggested a negative trend although the intervals include 0 (median $\lambda = 0.98$, 80% HDIs = [0.96, 1.01], $\text{pd} = 0.80$; McCabe *et al.* 2024). Inter-annual population growth rates had significant declines during six years (2005, 2011, 2012, 2015, 2016, and 2018; Figure 4) with 80% of HDIs excluding zero.

Taking sites from McCabe *et al.* (2024) separately, the only long-term breeding study site located in Canada (Bylot Island, Nunavut) does not show a significantly declining trend for Snowy Owl. This site is located in a large national park in the eastern high Canadian Arctic (73°N), in optimal Snowy Owl breeding habitat. The only other long-term research

site located in North America (Utqiagvik, Alaska, 71°N) is located in the lower latitude western Arctic. The Snowy Owl population trend at that site is significantly declining (median = -0.73, 80% HDIs = [-1.50, -0.04]; McCabe *et al.* 2024). Assuming that the main threat for Snowy Owl is climate change and the associated shrinking of tundra ecosystems towards the North Pole, it would be expected that population decline would first be detected in less-optimal habitat at lower latitudes, where the terrestrial impact of climate change may currently be stronger. Moreover, for all sites combined, population trends as percent change after three generations (1996–2020) were significantly negative (median = -35.8%, 80% HDIs = [-76.3%, -0.37%], $p = 0.82$), and based on this result of a decline >30%, McCabe *et al.* (2024) recommended that the species retain its IUCN status as Vulnerable (equivalent to a COSEWIC status of Threatened).

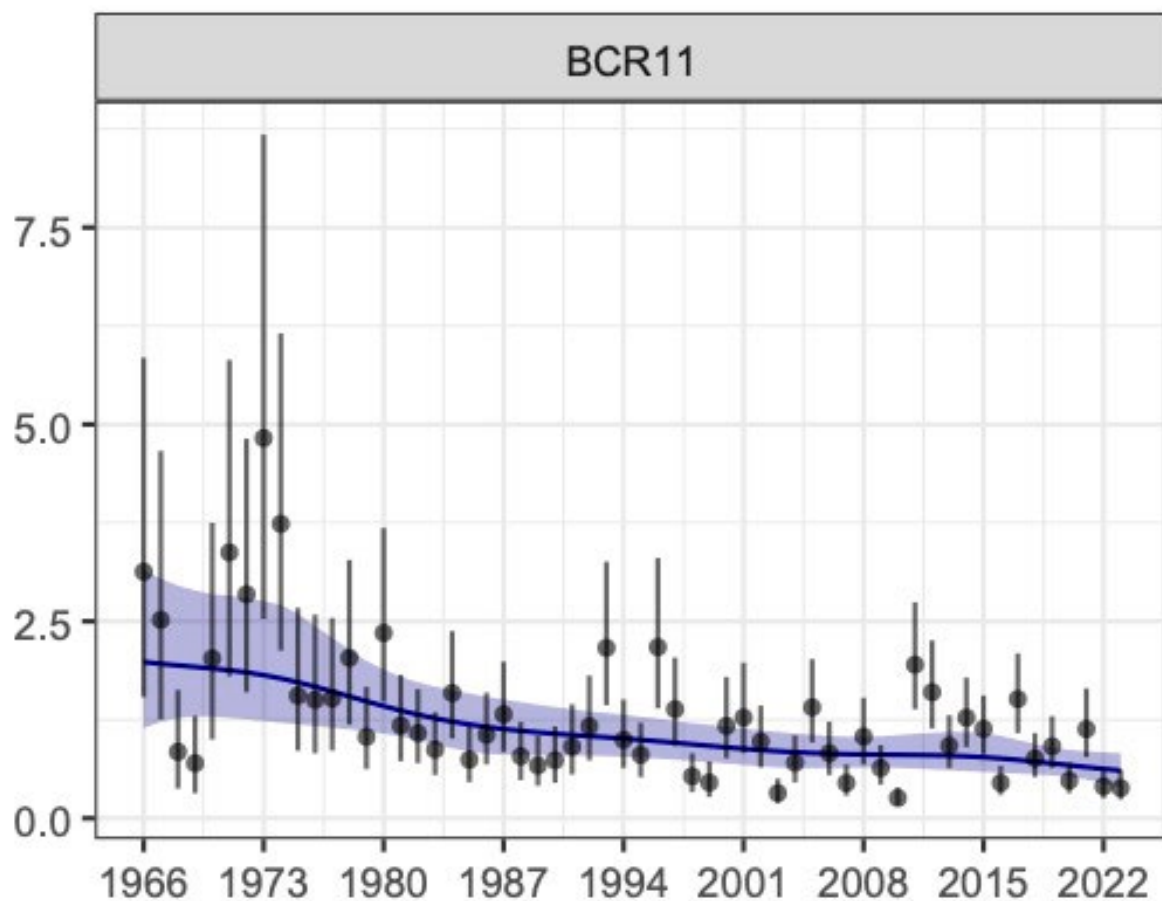


Figure 3. Population trend of Snowy Owl, 1966-2023, calculated from Christmas Bird Count abundance data, Bird Conservation Region 11 (Prairie Potholes). Shaded area shows 95% CI. Source: Meehan pers. comm. 2025.

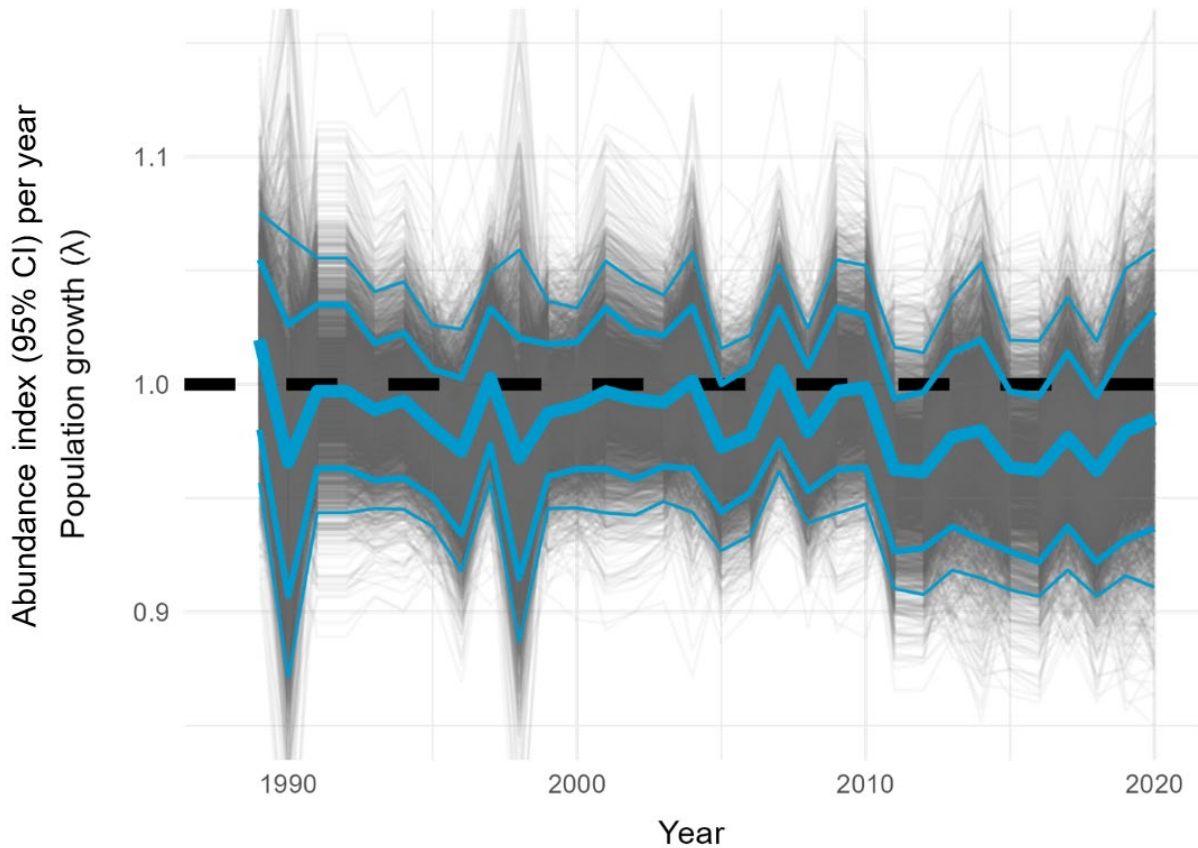


Figure 4. Inter-annual population growth rates (λ) of Snowy Owl combining four long-term monitoring sites worldwide (Wrangel Island, Karupelv Valley, Bylot Island, and Utqiagvik). Inter-annual population growth rate (λ) is the ratio of population size at the end of one interval to population size at the end of the previous interval. The median is depicted with a thick blue solid line, while the 80% and 95% highest density prediction intervals are depicted with medium and thin blue lines, respectively. Predictions from each posterior draw are depicted with gray lines. A horizontal dashed line where $\lambda = 1.0$ depicts a stable population. Source: McCabe *et al.* 2024.

Evidence for projected or suspected future decline (next 3 generations or 10 years, whichever is longer, up to a maximum of 100 years):

The Canadian population, which probably represents the core of the population worldwide, is expected to continue to decline because of ongoing threats on the breeding and non-breeding grounds, including a reduced availability and quality of tundra habitat harbouring enough lemmings to support reproduction in a rapidly changing Arctic (IPCC 2021). Based on the threats calculator (see **Threats**, below), these declines are projected to range from 3 to 70%.

Long-term trends:

Long-term CBC trends (1966-2023) of the wintering population (south of the boreal forest in Canada and the US) also show an ongoing decline, with a change over that period of -72.0% (95% CI: -87.3, -57.8) or -2.3% (95% CI: -3.6, -1.5) annually (Meehan pers. comm. 2025), and a decrease over time in the amplitude of population fluctuations (Figure 2). As threats to Snowy Owl have not ceased, and as the majority of identified threats are more likely to act in a density-independent way, it is predicted that declines will continue into the future.

Population fluctuations, including extreme fluctuations:

As noted above, Snowy Owl is an irruptive species showing large variation in breeding densities on a given site annually. However, these population fluctuations do not meet the COSEWIC definition of “extreme”, given that these variations occur over the whole distribution range and most likely do not reflect extreme fluctuations in the number of adult individuals in the population.

Severe Fragmentation

Given high mobility and dispersal behavior, fragmentation is unlikely to be severe.

Rescue Effect

Snowy Owl may be declining at an even faster rate in neighbouring countries than in Canada (Jacobsen *et al.* 2014; see Special Significance, above). Moreover, the global population is apparently in decline so rescue is considered unlikely.

THREATS

Historical, Long-term, and Continuing Habitat Trends

Climate change and the shrinking of the open tundra is already affecting Snowy Owl. Although some impacts of climate change are assessed as Unknown in this status report because they are difficult to quantify over the 3-generation period (24 years) of a threats assessment (see *Climate change and severe weather*, below), this is overall the single most serious plausible threat to the species over the longer term because of current and anticipated changes to breeding and wintering habitat in rapidly changing tundra ecosystems. Several different modelled projections suggest that the impacts of climate change on the Arctic habitat used by breeding Snowy Owl will increase in the future (IPCC 2021). Increases in precipitation (Ancil *et al.* 2014; Lamarre *et al.* 2018), blackflies (Solheim *et al.* 2013; Lamarre *et al.* 2018) and vegetation changes through shrubification (Mekonnen *et al.* 2021) all seem to be at play currently and/or are projected for the future in Canada. In their climate change vulnerability assessment, Foden *et al.* (2013), scored Snowy Owl as having High vulnerability overall and in all categories.

Current and Projected Future Threats

Snowy Owl is vulnerable to the cumulative effects of various threats over the next three generations, including global climate change and various development-related threats on the breeding and wintering grounds. Other threats include vehicle collisions, which seem particularly important in the southern part of Snowy Owl range in Canada (McCabe *et al.* 2021), as well as exposure to contaminants, diseases (e.g., West Nile virus, HPAI), electrocution, and collisions with aircraft and wind turbines (Fitzgerald pers. comm. 2023; Canadian Wildlife Health Cooperative 2025).

Global climate warming is likely to present a major threat to the species, both in the short- and long-term, especially through indirect food web effects affecting reproductive success via the potential dampening of fluctuations in lemming populations as seen in Fennoscandia (Ims *et al.* 2008, 2011; Kausrud *et al.* 2008; Gilg *et al.* 2009; but see Bilodeau *et al.* 2013; Gauthier *et al.* 2024b), or through the observed reduction in sea-ice extent in many areas of the Canadian Arctic, which is a habitat heavily used by Snowy Owl during the non-breeding season (Therrien *et al.* 2011; Robillard *et al.* 2018). These changes also have implications for adult and juvenile survival rates.

The nature, scope, and severity of these threats has been described in Appendix 1, following the IUCN-CMP (International Union for the Conservation of Nature – Conservation Measures Partnership) unified threats classification system (see Salafsky *et al.* 2008 for definitions and Master *et al.* 2012 for guidelines). The threat assessment process consists of assessing impacts for each of 11 main categories of threats and their subcategories, based on the scope (proportion of population exposed to the threat over the next 10-year period), severity (predicted population decline within the scope during the next 10 years or 3 generations, whichever is longer up to ~100 years), and timing of each threat. The overall threat impact is calculated by taking into account the separate impacts of all threat categories and can be adjusted by the species experts participating in the threats evaluation. Threats to Snowy Owl with an assessed impact of greater than Negligible are discussed below in order of importance, with threats of Unknown impact over the assessed period included in the discussion. Supporting details, and notes on Negligible threats, can be found in Appendix 1.

The overall assigned threat impact for Snowy Owl was High – Medium (see Appendix 1), corresponding to an anticipated further decline of between 3 and 70% over the next three generations, or 24 years. These values are to be interpreted with caution, as they can be based on information about which there may be considerable uncertainty, although efforts have been made to corroborate the scores with available studies and quantitative data.

Invasive & other problematic species & genes (IUCN 8; overall threat impact High – Low)

Problematic native species/diseases (IUCN 8.2; Unknown threat impact)

While recent and ongoing northern expansion of blackflies (as a result of global warming) poses threats to both incubating adults and ground-dwelling nestlings of raptors, including Snowy Owl (Solheim *et al.* 2013; Lamarre *et al.* 2018), quantitative evidence for impacts on Snowy Owl currently seems limited, with desertion by females due to blackflies only reported at 2 of 28 (7%) of studied nests in Fennoscandia in 2011, in the southern portion of the species' range (Solheim *et al.* 2013; see also **Interspecific Interactions**, above, and **IUCN 11.1**, below). Corroborating evidence for blackfly impacts is provided by the observation that captive Snowy Owl chicks in southern Canada often cannot be fledged because of issues with biting flies (Petersen pers. comm. 2025). However, there is currently very little evidence to suggest that blackflies could cause population decline through lower reproductive and/or survival rates, because blackflies do not occur range-wide.

Viral/prion introduced diseases (IUCN 8.5; High – Low threat impact)

Reports of HPAI and West Nile Virus in Snowy Owl from rehabilitation centers (Fitzgerald pers. comm. 2023) and of HPAI in dead birds (Canadian Wildlife Health Cooperative 2025; CBC News 2025) shows these diseases affect individuals, and HPAI causes high mortality rates in raptors (Hall *et al.* 2024). However, overall effect on population trend remains highly uncertain, resulting in uncertainty ranges applied to scope and severity for this threat. The potential exists for disease to affect a large proportion of the population through direct mortality as well as decreased body condition and survival rates. Reliance by Snowy Owl on avian prey, including waterfowl, at certain times of year, provides a clear route of exposure to HPAI.

Transportation & service corridors (IUCN 4; overall threat impact Medium – Low)

Roads & railroads (IUCN 4.1; Medium – Low threat impact)

Necropsies conducted on >400 Snowy Owls revealed that vehicle collisions are among the most important cause of mortality in the non-breeding season (Weidensaul pers. comm. 2023), as did another study that included necropsies of 365 Snowy Owls (cause of death in 18-22% of individuals, the single highest cause of death reported; McCabe *et al.* 2021). Owls in general are particularly vulnerable to vehicle collisions (Bishop and Brogan 2013). This could also become an issue in the Arctic breeding grounds if more roads are developed there. However, a large proportion of collision-related mortality may be compensatory, i.e., affecting predominately young owls that could have died anyway (McCabe *et al.* 2021). This threat is considered pervasive, because most owls are potentially exposed to roads at some point during their life.

Utility & service lines (IUCN 4.2; Low threat impact)

Individuals collide with power lines (Fitzgerald pers. comm. 2023), but there is no clear indication that this could be a major threat given that Snowy Owl hunts using mostly short flights at relatively slow speed. In a study of winter survival, 3-6% of necropsied owls were found to have died of electrocution (McCabe *et al.* 2021). This threat is considered pervasive because most owls are potentially exposed to power lines at some point during their lives.

Shipping lanes (IUCN 4.3; Low threat impact)

Increased Arctic shipping could be an issue given disturbance in sea ice (e.g., opening of polynyas and dispersing potential prey), where Snowy Owl is known to hunt for significant periods of its annual cycle (Therrien *et al.* 2011). More research on the impact of shipping lanes is needed. Direct mortality caused by ships is probably limited, but displaced individuals are likely pushed into sub-optimal habitats, resulting in lower body condition and lower subsequent reproductive success.

Flight paths (IUCN 4.4; Low threat impact)

Collision with aircrafts is a major cause of mortality during the non-breeding season (Smith 1997; 9-11% of necropsied birds, McCabe *et al.* 2021). However, a large proportion of collision-related mortality may be compensatory, affecting predominately immature birds (McCabe *et al.* 2021). Snowy Owl is attracted to the tundra-like habitat of commercial airports and are sometimes subject to lethal control at them, although the recommended control measures in Canada only comprise live-trapping and relocation, and measures to make airports less attractive to the species (Transport Canada 2002; Bennett pers. comm. 2025)

Pollution (IUCN 9; overall threat impact Medium – Low)

Agricultural & forestry effluents (IUCN 9.3; Medium – Low threat impact)

Secondary poisoning resulting from exposure to anticoagulant rodenticides (i.e., rat poison; ARs) on wintering grounds is increasingly becoming an issue, with >50% of necropsied Snowy Owl carcasses harbouring various levels of ARs (Weidensaul, pers. comm. 2023). Use of anticoagulant rodenticides is increasing and widespread globally (Elliott *et al.* 2024). While owls are presumed to be exposed to ARs primarily through consumption of rat prey, AR residues in bird and other mammalian prey species has also been documented as a source of AR exposure in raptors in general (Nakayama *et al.* 2019; Cooke *et al.* 2023). Effects of coagulopathy induced by ARs include death, inappetence, and weakness (Hommerding 2022). Note that if rodenticide-affected owls are more likely to be killed by threats such as collisions, those deaths are captured under those threats.

Air-borne pollutants (IUCN 9.5; Unknown threat impact)

Mercury, lead, and other contaminants have been detected in Snowy Owl, but their effects on the population remain largely unknown. Several other compounds (e.g., DDT, PCBs) likely to affect predators such as Snowy Owl are present in the environment during the breeding and non-breeding periods, but have not been empirically measured in the species.

Residential & commercial development (IUCN 1; overall threat impact Low).

Housing & urban areas (IUCN 1.1; Low threat impact)

Construction of new housing and residential areas remove winter foraging habitat and potentially force owls into suboptimal habitats, reducing adult and juvenile survival rates. Knowing that anthropogenic mortality during winter can be high, this is likely to affect the species, although winter mortality predominantly affects young birds and could in part be compensatory (McCabe et al. 2021). Collisions with buildings is a potential threat.

Commercial & industrial areas (IUCN 1.2; Low threat impact)

Construction of new commercial and industrial areas in non-breeding and breeding habitats (e.g., warehouses, mines; threat 3.2) remove foraging habitat and potentially force owls into suboptimal foraging, reducing adult and juvenile survival rates. Knowing that anthropogenic mortality during winter can be high, this is likely to affect the species, although winter mortality predominantly affects young birds and could in part be compensatory (McCabe et al. 2021). Collisions with buildings is a potential threat.

Energy production & mining (IUCN 3; overall threat impact Low)

Oil & gas drilling (IUCN 3.1; Low threat impact)

Natural resource extraction on the breeding grounds, although localized, has the potential to severely affect nesting conditions and cause direct mortality to nesting adults and young.

Mining & quarrying (IUCN 3.2; Low threat impact)

Natural resource extraction on the breeding grounds, although localized, has the potential to severely affect nesting conditions and cause direct mortality to nesting adults and young.

Renewable energy (IUCN 3.3; Low threat impact)

More research is needed on the impact of wind farms, but some observations suggest difficult co-habitation with wind turbines (owls vacating areas they used during winter, forcing owls into sub-optimal habitats; Weidensaul pers. comm. 2023). The magnitude of collision risk with wind farms currently remains uncertain, although there is definitely a potential for collisions with turbines (Jacobsen *et al.* 2012), lowering survival rate.

Climate change and severe weather (IUCN #11; overall threat impact Low)

As noted in **Historical, Long-term, and Continuing Habitat Trends**, above, some impacts of climate change on Snowy Owl are difficult to quantify over the 3-generation period of a threats assessment. Climate change is nonetheless considered the single most serious plausible threat to the species over the longer term.

Habitat shifting and alteration (IUCN 11.1; Unknown threat impact)

The rate of climate change is expected to increase and potentially speed up, especially on Arctic breeding grounds. The phenomenon of shrubification (Mekonnen *et al.* 2021) seems to reduce the area of suitable nesting habitat for Snowy Owl, although this effect is not confirmed or quantified, and it is possible that breeding habitat loss is offset because of newly open, formerly frozen areas becoming available. Shrubification simultaneously has the potential to increase population sizes of prey species such as ptarmigan and lemmings, but it could also promote competition with other owl species following the retreat of tundra habitat (Mysterud 2016). Globally, a reduction in sea-ice extent caused by climate change could reduce the extent of a significant wintering habitat for adult owls (Therrien *et al.* 2011).

ATK reported that climate change is having an impact on Snowy Owl within Gwich'in traditional areas where increasing temperatures have expanded suitable insect habitat, resulting in a greater abundance of parasitic and biting flies which the species did not previously have to endure during some months of the year (Gwich'in Knowledge of Insects 2017).

Inuit from communities along the eastern shore of Baffin Island attributed the decline in Snowy Owl observations to warmer weather (Sansoulet *et al.* 2020).

Storms and flooding (IUCN 11.4; Low threat impact)

Rainstorms are becoming more common on the Arctic breeding grounds and could lead to nest failures if eggs/nestlings are exposed to cold and wet (as seen in Peregrine Falcon *F. peregrinus*; Anctil *et al.* 2014).

Other impacts (IUCN 11.5; Unknown threat impact)

Climate change seems to be affecting populations of the main prey item (i.e., lemmings) via the formation of ice-crusts, which can reduce the habitability of a thick snowpack (Berteaux *et al.* 2017; Domine *et al.* 2018), and cause a change in lemming population dynamics with the potential dampening of peak abundances (Ims *et al.* 2008, 2011; Kausrud *et al.* 2008; Schmidt *et al.* 2012) – although results of studies on changes to lemming population cycles currently remain inconclusive globally (Bilodeau *et al.* 2013; Gauthier *et al.* 2024b).

Agriculture & aquaculture (IUCN 2; overall threat impact Unknown)

Annual & perennial non-timber crops and Livestock farming & ranching (IUCN 2.1; and 2.3 Unknown threat impacts)

Ongoing conversion of agricultural lands (from extensive to intensive agriculture) is expected, potentially removing winter foraging habitat and forcing owls into suboptimal habitats (cf. Chang and Wiebe 2016, 2018), thus reducing adult and juvenile survival rates, especially in the Prairies. Conversion of natural habitat is ongoing and grassland loss through agricultural conversion continues at a high rate in the northern Great Plains (Gage *et al.* 2016, Watmaugh *et al.* 2017). It is plausible that agricultural intensification and other practices is affecting prey populations of overwintering owls directly or indirectly (e.g., via impacts of intensification on prey populations; Court pers. comm. 2024). However, there is currently no direct evidence linking agricultural practices to Snowy Owl population declines and grazing by cattle in areas of ‘tame’ forage likely maintains vegetation at a height that is advantageous for hunting owls (Fisher pers. comm. 2024). Hence overall impact is Unknown.

Biological resource use (IUCN 5; overall threat impact Unknown)

Hunting & collecting terrestrial animals (IUCN 5.1; Unknown threat impact)

Traditional harvest and illegal shooting are still happening in Canada, including on the wintering grounds (cf. McCabe *et al.* 2021), but the estimated numbers of individuals killed in this way annually and especially by age classes are not available. Capture in leg hold traps has been reported (Durham 1981), but frequency is unknown.

Human intrusions & disturbance (IUCN 6; overall threat impact Unknown)

Recreational activities (IUCN 6.1; Unknown threat impact)

There is increasing disturbance caused by amateur photographers and commercial guides as the number of people participating in these activities is increasing (including a number of tour operators offering multi-day photography workshops on Snowy Owl in Quebec, Ontario, Saskatchewan, and Alberta). Such photographers can interact with owls throughout the day during the non-breeding season, potentially pushing them into or

encouraging them to occupy sub-optimal habitats (Fitzgerald pers. comm. 2023; Artuso pers. comm. 2024), with a resulting potential lowering of body condition and increased mortality. Baiting associated with photography habituates birds to human and vehicle presence, and may draw them closer to roads, where they are vulnerable to collisions. Although habituation of wildlife to human interactions is generally known to have deleterious effects on individuals (Knight 2009), the population-level impact of this threat on Snowy Owl is unknown.

Number of Threat Locations

Although the primary threat to this species, climate change, is affecting habitat across the Arctic, the indirect climate-mediated effects that threaten Snowy Owl (e.g., shrubification, sea ice loss) vary across regions; therefore, the number of threat-based locations across the owl's Canadian range is much greater than ten.

PROTECTION, STATUS, AND RECOVERY ACTIVITIES

Legal Protection and Status

Snowy Owl is not protected in Canada under the *Migratory Birds Convention Act*, 1994 (nor was it protected in its original version in 1917), as owls (Strigiformes) were excluded from this Act. However, it receives some protection under a Wildlife Act (or equivalent) in every province and territory (Government of Canada 2017).

Non-Legal Status and Ranks

Snowy Owl is classified by IUCN as Vulnerable globally (BirdLife International 2021) and is on the Watch list (yellow) for North America by Partners in Flight. NatureServe (2020) ranks for Canadian provinces and territories are as follows: S1 (Yukon); S1B,S3N,SUM (Labrador); S1N,S2S3M (New Brunswick; likely to be assigned to a lesser risk category, as a rare but regular visitor; Klymko pers. comm. 2025); S3N (Manitoba); S3N,SUM (Island of Newfoundland); S4 (Nunavut, Quebec); S4N (Alberta, Ontario); S5 (Northwest Territories); S5N (Saskatchewan); SNA (Nova Scotia); and SUN (British Columbia, Prince Edward Island). The species is ranked in only two US states bordering Canada: Maine (S2S3N) and Washington (S3N).

Land Tenure and Ownership

Snowy Owl has been recorded breeding in several national and territorial parks (e.g., Sirmilik, Auyuittuq, Aulavik), in some cases in high numbers when lemmings are numerous, but is known to vacate these areas when the prey populations decline. During the non-breeding season, some habitat protection programs aimed at other species may be beneficial for Snowy Owl. In particular, Operation Grassland Community and the MULTISAR Program in Alberta, and Operation Burrowing Owl in Saskatchewan, focus on preservation and enhancement of grassland habitat, which would benefit wintering Snowy

Owl. Snowy Owl also uses the sea-ice during winter, and thus falls under federal jurisdiction there.

Estimated parks areas in the tundra are: Sirmilik, 22,200 km²; Ukkusiksalik, 20,885 km²; Auyuittuq, 21,470 km²; Aulavik, 12,200 km²; Qikiqtaruk – Herschel Island, 116 km²; Quttinirpaaq, 37,775 km²; Qausuittuq, 11,000 km². Outside of the tundra, protected areas (e.g., Tallurutiup Imanga National Marine Conservation Area, Thaidene Nënë, Edézhíé, Ts'udé Niljné Tueyata, Wapusk National Park, Thelon Wildlife Sanctuary, Grasslands National Park, and the incipient Seal River Watershed Indigenous Protected Area) could provide important non-breeding habitats.

INFORMATION SOURCES

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COLLECTIONS EXAMINED

No collections were examined for the preparation of this report.

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After a BSc at Université de Sherbrooke with an Honours thesis on raptor migration and a MSc at Université Laval, Dr. J.F. Therrien earned his PhD degree at Université Laval in 2012 studying trophic interactions among Arctic raptors and their prey with a special focus on movement ecology of Snowy Owls. He has since continued studying every aspect of Snowy Owl biology (survival and reproduction rates, numerical and functional responses, dispersal...) throughout the species' circumpolar range. Dr. Therrien is recognized as one of the few Snowy Owl experts in the world. Dr. Therrien has authored or co-authored over 70 scientific publications in international journals, 30 of which are on Snowy Owls.

Dr. Kyle Elliott completed his BSc at UBC with an Honours thesis on raptor populations in the Fraser Delta. He continued with a MSc and PhD at the University of Manitoba studying Arctic seabirds. He is now the Canada Research Chair in Arctic Ecology at McGill University. He has authored or co-authored over 140 scientific publications in international journals, including several on Snowy Owls and raptors in general (ecotoxicology, survival, reproduction, non-breeding season, movement ecology). He has also written numerous federal government reports.

Appendix 1. Threats calculator for Snowy Owl (*Bubo scandiacus*)

Species or Ecosystem Scientific Name		Snowy Owl (<i>Bubo scandiacus</i>)					
Element ID		Elcode					
Date (Ctrl + ";" for today's date):		10-6-2024					
Participants:		Jean Francois Therrien (writer), Kyle Elliott (writer), Dwayne Lepitzki (facilitator), Louise Blight (Birds SSC Co-chair), Joanna James (Secretariat), Aija White, Aleksandr Sokolov, Allison Thompson, Amanda Weltman, Andrew Horn, Audrey Robillard, Bonnie Dell, Carla Nevin, Carol Oyagak, Christian Artuso, Claire Singer, Eric Gross, Erin Swerdfeger, Eve Lamontagne, Gilles Gauthier, Gord Court, Guy Fitzgerald, Jason Dicker, Jay Frandsen, John Brett, Kathy St-Laurent, Kyle Ritchie, Lorriane Green, Madison Shaw, Marcel Gahbauer, Nathan Hentze, Nancy Bouchard, Nicolas Lecomte, Pete Davidson, Rebecca McCabe, Rhiain Clarke, Richard Hedley, Robin Gutsell, Ryan Durack, Ryan Fisher, Scott Weidensaul, Willow English					
References:							
Overall Threat Impact Calculation Help:				Level 1 Threat Impact Counts			
		Threat Impact		high range		low range	
		A	Very High	0		0	
		B	High	1		0	
		C	Medium	2		0	
		D	Low	3		6	
Calculated Overall Threat Impact:				Very High		Medium	
Assigned Overall Threat Impact:				BC = High - Medium			
Impact Adjustment Reasons:				Adjusted to High - Medium as it was thought that several scored threats were on the lower end of their range (e.g., 1% where range is Slight, 1-10%) and that this is a more realistic representation of impacts of future threats over next three generations.			
Overall Threat Comments				Generation time 8 years so timeframe for severity and timing is 24 years into the future; NAR (1995); 42.6% decline last 3 gens on wintering range, but uncertainty around this estimate. Recent article (Gauthier et al. 2024) suggests limited detected effect of climate change on lemming cyclicity up to 2019 but nonetheless mentions ongoing potential disruption of lemming and ecosystem functioning; IUCN vulnerable (2017). Threats considered on the breeding (e.g., rapidly changing tundra ecosystem: shrubification (not clear if positive or negative for snowy owl), effects of increasing temps on lemmings & blackflies - little quantitative evidence so far of blackfly negative impact on Snowy Owl) and non-breeding (i.e., 23% morts non-breeding range from weather exposure, disease, predation, starvation; 17-22% vehicle and 8-11% aircraft collisions; 3-5% electrocution) ranges BUT mortality does not necessarily result in population decline. Range: Figure 1. Telecon participants agree that a projected decline of around 30% seems reasonable and assessment here shouldn't be lower than that given that future decline is unlikely to be less than past decline because threats are not lessening, and potentially other threats most likely occurring in the coming 10 - 24 years.			

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1	Residential & commercial development	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	
1.1	Housing & urban areas	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	Construction of new housing and residential areas removing winter foraging and potentially forcing owls into suboptimal habitats (e.g. residential roads, buildings) habitat. Limited adjacent foraging habitat? Collisions with buildings. Score value probably close to 1%

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1.2	Commercial & industrial areas	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	Construction of new commercial and industrial areas removing winter foraging and potentially forcing owls into suboptimal habitats (e.g. warehouses) and breeding (e.g. mines, threat 3.2) habitat; collisions with buildings. Score value probably close to 1%
1.3	Tourism & recreation areas						
2	Agriculture & aquaculture		Unknown	Small (1-10%)	Unknown	High (Continuing)	
2.1	Annual & perennial non-timber crops		Unknown	Small (1-10%)	Unknown	High (Continuing)	Expected ongoing conversion of agricultural lands (extensive to intensive agriculture) potentially removing winter foraging habitat and potentially forcing owls in suboptimal habitats, especially in the Prairies (Chang & Wiebe 2016, 2018), reducing adult and juvenile body condition and survival and ultimately reproductive success. However, Snowy Owl uses of agricultural lands in the Prairies is restricted to the non-breeding season when agricultural activities are reduced. Recent and future projected conversion is ongoing.
2.2	Wood & pulp plantations						
2.3	Livestock farming & ranching		Unknown	Small (1-10%)	Unknown	High (Continuing)	Expected ongoing conversion of agricultural lands (extensive to intensive agriculture) potentially removing winter foraging habitat and potentially forcing owls in suboptimal habitats, especially in the Prairies (Chang & Wiebe 2016, 2018), reducing adult and juvenile body condition and survival and ultimately reproductive success. However, Snowy Owl uses of agricultural lands in the Prairies is restricted to the non-breeding season when agricultural activities are reduced. Recent and future projected conversion is ongoing.
2.4	Marine & freshwater aquaculture						
3	Energy production & mining	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	
3.1	Oil & gas drilling	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	Natural resource extraction on the breeding grounds, although localized, has the potential to severely affect nesting conditions and causing direct mortality to nesting adults and young.
3.2	Mining & quarrying	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	Natural resource extraction on the breeding grounds, although localized, has the potential to severely affect nesting conditions and causing direct mortality to nesting adults and young.
3.3	Renewable energy	D	Low	Small (1-10%)	Moderate - Slight (1-30%)	High (Continuing)	More research needed on the impact of wind farms, but some observations suggest difficult co-habitation with wind turbines (owls vacating areas they used during winter, forcing owls in sub-optimal habitats; Weidensaul, pers.comm. 2023). The magnitude of collision risk with wind farms remains uncertain at this point although there is definitely a potential for collisions with turbines (Jacobsen et al. 2012), reducing adult and juvenile survival rates.
4	Transportation & service corridors	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
4.1	Roads & railroads	C	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	Collision with vehicles is a major cause of mortality during the non-breeding season (necropsies conducted in over 400+ snowy owls revealed that vehicle collisions are among the most important cause of mortality; Weidensaul pers. comm. 2023). This could also become an issue if more roads are developed in the Arctic breeding grounds. However, a large proportion of collision-related mortality may be compensatory, i.e. affecting predominately young owls that could have died anyway (McCabe et al. 2021). This threat is, however, pervasive because most owls potentially exposed to roads at some point during their life.
4.2	Utility & service lines	D	Low	Pervasive (71-100%)	Slight (1-10%)	High (Continuing)	Collisions with power lines (and related electrocution) are happening, but there is no clear indication that this could be a major threat given that hunting method is mostly short flights at relatively slow speed. This threat is nonetheless pervasive because most owls are potentially exposed to power lines at some point during their lives.
4.3	Shipping lanes	D	Low	Restricted (11-30%)	Slight (1-10%)	High (Continuing)	Increased Arctic shipping could be an issue given disturbance in sea ice (e.g. opening of polynyas and dispersing potential prey) where Snowy Owl is known to hunt for significant periods of its annual cycle (Therrien et al. 2011). More research on the impact of shipping lanes is needed. Direct mortality caused by ships probably limited, but individuals pushed into sub-optimal habitats, resulting in lower body condition and lower subsequent reproductive success.
4.4	Flight paths	D	Low	Restricted (11-30%)	Slight (1-10%)	High (Continuing)	Collision with aircrafts is a major cause of mortality during the non-breeding season (Smith 1997). However, a large proportion of collision-related mortality may be compensatory as it affects predominately young birds (McCabe et al. 2021).
5	Biological resource use		Unknown	Small (1-10%)	Unknown	High (Continuing)	
5.1	Hunting & collecting terrestrial animals		Unknown	Small (1-10%)	Unknown	High (Continuing)	Traditional harvest and illegal shooting are still happening, but the estimated numbers of killed individuals in this way annually and especially by age/sex classes are not available. Capture in leg hold traps reported, but frequency unknown.
5.2	Gathering terrestrial plants						
5.3	Logging & wood harvesting						
5.4	Fishing & harvesting aquatic resources						
6	Human intrusions & disturbance		Unknown	Restricted (11-30%)	Unknown	High (Continuing)	
6.1	Recreational activities		Unknown	Restricted (11-30%)	Unknown	High (Continuing)	Increasing disturbance caused by photographers and outfitters as the number of people participating in these activities is increasing, bothering owls throughout the day during the non-breeding season and potentially pushing them in sub-optimal habitats, lowering body condition and potentially increasing mortality.
6.2	War, civil unrest & military exercises		Negligible	Negligible (<1%)	Negligible (<1%)	High (Continuing)	Breeding Snowy Owls in the vicinity of North Warning Systems stations, but impact of such stations on mortality potentially negligible.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
6.3	Work & other activities		Negligible	Small (1-10%)	Negligible (<1%)	High (Continuing)	There are no known impacts of research projects. It is assumed that 1-10% of the total number of individuals are exposed to research projects when banding activities are included, e.g., one banding location is capable of banding ~1% of population. However, the impact (severity) of such activities seems negligible.
7	Natural system modifications						
7.1	Fire & fire suppression						
7.2	Dams & water management/use						
7.3	Other ecosystem modifications						
8	Invasive & other problematic species & genes	BD	High - Low	Large - Small (1-70%)	Serious - Slight (1-70%)	High (Continuing)	
8.1	Invasive non-native/alien species/diseases						
8.2	Problematic native species/diseases		Unknown	Restricted (11-30%)	Unknown	High (Continuing)	Recent and ongoing northern expansion of black flies (because of global warming) pose threats to both incubating adults and ground-dwelling nestlings (Lamarre et al. 2018). However, at this point for Snowy Owl, there is little quantitative evidence (cf. Solheim et al. 2013) and very little evidence this could cause population decline through lower reproductive and/or survival rates because black flies don't occur range-wide.
8.3	Introduced genetic material						
8.4	Problematic species/diseases of unknown origin						
8.5	Viral/prion-induced diseases	BD	High - Low	Large - Small (1-70%)	Serious - Slight (1-70%)	High (Continuing)	There have been reports of Highly Pathogenic Avian Influenza (HPAI) and West Nile Virus (WNV) in Snowy Owl from rehabilitation centers, and dead Snowy Owls collected (Fitzgerald pers. comm. 2023; Canada Wildlife Health Cooperative 2025). The actual overall effect on population trend remains highly uncertain, but the disease has the potential to affect a large proportion of the population (thus large bracket of scope and severity), through lower body condition and survival rates. Mortality rate in raptors affected by HPAI very high (Hall et al. 2024), so development of immunity perhaps unlikely.
8.6	Diseases of unknown cause						
9	Pollution	CD	Medium - Low	Large (31-70%)	Moderate - Slight (1-30%)	High (Continuing)	
9.1	Domestic & urban waste water						
9.2	Industrial & military effluents						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
9.3	Agricultural & forestry effluents	CD	Medium - Low	Large (31-70%)	Moderate - Slight (1-30%)	High (Continuing)	Steady increase and widespread use of anticoagulant rodenticides (rat poison) on wintering grounds becoming an issue with >50% of necropsied Snowy Owls harboring various levels (Weidensaul pers. comm. 2023). Note that if rodenticide-affected owls are more likely to be killed by threats such as collisions, those deaths are captured under those threats.
9.4	Garbage & solid waste						
9.5	Air-borne pollutants		Unknown	Large (31-70%)	Unknown	High (Continuing)	Mercury, lead and other contaminants have been detected in Snowy Owl, but their severity in affecting global population remain largely unknown.
9.6	Excess energy						
10	Geological events						
10.1	Volcanoes						
10.2	Earthquakes/tsunamis						
10.3	Avalanches/landslides						
11	Climate change & severe weather	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	
11.1	Habitat shifting & alteration		Unknown	Large (31-70%)	Unknown	High (Continuing)	Climate change is expected to increase and potentially speed up, especially on Arctic breeding grounds. The phenomenon of shrubification (Mekonnen et al. 2021) seems to reduce the area of suitable habitat for nesting Snowy Owl, although not confirmed and potentially increasing prey populations (e.g. ptarmigans, lemmings). Its overall effect on global population remains largely unknown because overall available breeding habitat could be retreating or even increasing because of newly open formerly frozen areas becoming available. Globally, a reduction in sea-ice extent caused by climate change could threaten a significant wintering habitat for adult owls (Therrien et al. 2011).
11.2	Droughts						Extreme droughts could affect prey abundance - but little evidence of this happening now or in the next 3 generations in the tundra.
11.3	Temperature extremes						
11.4	Storms & flooding	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	Rainstorms becoming more common on the Arctic breeding grounds and could lead to nest failures if eggs/nestlings are exposed (as seen in Peregrine Falcons; Ancill et al. 2014)
11.5	Other impacts		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	Climate change seems to be affecting the main prey item (i.e. lemmings) populations via the formation of ice-crusts (reducing the insulation barrier of a thick snowpack; Ims et al. 2011, Berteaux et al. 2017), and causing a change in population dynamics with the potential dampening of peak abundances (Ims et al. 2008, 2011, Schmidt et al. 2012), although results remain equivocal globally (Gauthier et al. 2024).

Classification of Threats adopted from IUCN-CMP, Salafsky et al. (2008).