

Ontario Species at Risk Evaluation Report for

Hoary Bat

Chauve-souris cendrée de l'Est

(Lasiurus cinereus)

Committee on the Status of Species at Risk in Ontario
(COSSARO)

Assessed by COSSARO as Endangered

January 2024

Final

Executive summary

The Hoary Bat (*Lasiurus cinereus*) is a large-bodied bat and is the largest bodied bat in Canada. It is identified by light fur around its face and neck and white-tipped hairs over most of its body. It is very widely distributed across Canada and Ontario. Along with Eastern Red Bat (*L borealis*) and Silver-haired Bat (*Lasionycteris noctivagans*), Hoary Bat is a migratory bat species that migrates long distances between summer breeding habitat and winter range. They are considered long-lived and give birth to more than one pup per year. It's habitat requirements include foraging, drinking and tree roosting habitats.

As a migratory species, Hoary Bat is exposed to considerable risk during long-distance movements. Threats to this species are considered significant and ongoing and identified as mortality from wind turbines, ongoing declines in insect prey abundance, loss of forest roosting habitat and pollution. Wind energy development is the most immediate and concerning threat to Hoary Bat. Population viability modeling (COSEWIC 2023, IN PRESS) estimates the probability of extinction is at least 20% by 2050 or 3 generations and population reductions are estimated at greater than 50%, with some assumptions. Given this information, Hoary Bat was assessed by COSSARO as Endangered in November 2023. The species was designated by COSEWIC as Endangered in May 2023.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

The taxonomic status of the genus *Lasiurus* is discussed in (COSEWIC 2023, IN PRESS), in which Hoary Bat and Red Bat (*L. borealis*) should be separate genera or subgenera. It is also suggested that South American populations (*L.c. villosissimus*) and Hawaiiin populations (*L.c. semotus*) may be separate species. The North American population (*L.c. cinereus*) is considered and assessed by COSEWIC (2023), and COSSARO.

1.1.2. Designatable units

A single designatable unit occurs in Canada and North America for this species.

1.1.3. Native status

Hoary Bat is native to Ontario.

1.1.4. Occurrence

Hoary Bat is considered among the widest ranging native terrestrial mammals in the Western Hemisphere (COSEWIC 2023, IN PRESS).

1.2. Eligibility results

Hoary Bat (*Lasiurus cinereus*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G3 (Vulnerable) (Last Reviewed 10/6/2022) (NatureServe, accessed 11/11/2023)
- IUCN: LC (Least Concern) (Assessed: 20 July 2015) (IUCN accessed 11/11/23)
- NRANK Canada: N5B,NUM
- COSEWIC: Endangered (May 2023)
- SARA: END (not on Schedule 1)
- ESA 2007: Not Listed
- SRANK: S4 Apparently Secure (ranked in 1995, NHIC accessed 11/11/2023)

2.2. Distribution in Ontario

Distribution in Canada and the range map in COSEIWC (2023) are based on visual records. Records based solely on acoustic data were excluded. Hoary Bat is widespread in Canada and recorded in all provinces and territories. It is a migratory species and winters outside of Canada. It is uncommon in the Hudson Bay region during the summer (Layng et al. 2019, as cited in COSEWIC 2023, IN PRESS), and documented during migration near James Bay (Nagorsen and Nash 1984, as cited in COSEWIC 2023, IN PRESS). Data were considered insufficient to delineate the northern range of Hoary Bat.

Multiple sources of information contributed to observations that were used to assess trends in population, including: mark and recapture studies, emergence counts, carcass searches at wind energy facilities, rabies submission rates. In Ontario, the range covers nearly all of the province, except for the most northern edge along Hudson's Bay.

NHIC element occurrence data was not available to assess the population information specific to Ontario.

2.3. Distribution, status and the broader biologically relevant geographic range outside Ontario

Hoary Bat is a wide-ranging species across North America. Regional distinctions are not identified. Several studies have shown high fidelity between year and within a breeding season to roost trees. Not much is known about juveniles returning to natal areas or juvenile dispersal. During migration, it moves from Canada into the southern United States and Mexico. Acoustic recording has reported Hoary Bat possibly in Southern Ontario in the winter (GBIF 2017, cited in COSEWIC 2023, IN PRESS).

Trends in the immediate adjacent jurisdictions (provinces and states) are anticipated to be similar for the entire range of the species. Globally Hoary Bat is assessed as G3, last reviewed in 2022. The greatest threat identified is from wind energy centres during migration. In May 2023, COSEWIC assessed this species as Endangered. Quebec and Manitoba identify Hoary Bat as Vulnerable (S3B). Adjacent states in the United States indicate the species ranks from vulnerable to secure. In some cases, rankings of secure are considered dated. Quebec is the only jurisdiction that lists Hoary Bat on the "Act respecting threatened or vulnerable species". In Ontario, bats are further protected under the *Fish and Wildlife Conservation Act*.

Table 1. Condition of the Species in Adjacent Jurisdictions and Broader Biologically Relevant Geographic Range

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Condition	Notes & Sources
Quebec	Y	S3B	NatureServe, accessed 11/11/2023
Manitoba	Y	S3B	NatureServe, accessed 11/11/2023
Michigan	Y	S5	NatureServe, accessed 11/11/2023
Minnesota	Y	S5	NatureServe, accessed 11/11/2023
Nunavut	Y	SUB	NatureServe, accessed 11/11/2023
New York	Y	S3BS4B	NatureServe, accessed 11/11/2023
Ohio	Y	SNR	NatureServe, accessed 11/11/2023
Pennsylvania	Y	S4	NatureServe, accessed 11/11/2023
Wisconsin	Y	S3	NatureServe, accessed 11/11/2023
<i>Global Rank</i>	Y	G3	COSEWIC 2023, IN PRESS; NatureServe, accessed 11/11/2023

2.4. Ontario conservation responsibility

The global range for Hoary Bat that occurs in Ontario is anticipated to be <25%, and Ontario's conservation responsibility is considered low.

2.5. Direct threats

A threats assessment was completed in COSEWIC (2023), including threats to the species in Canada, during migration and on wintering grounds outside of Canada. The overall threat category assigned for the species is very high to high. Threats were identified to include wind energy development (high to very high impact), decline in prey availability (medium to high impact), pollution (low to medium impact), loss of roosting habitat (low impact), and climate change (unknown).

Wind energy development is identified as the greatest threat to migratory bat species (Fleming et al. 2003, cited in COSEWIC 2023, IN PRESS). Bat mortality at turbines is comprised of 75 to 80% migratory bats and are the most common groups of bats killed at wind turbines in North America. Wind energy development is currently widespread in Southern Ontario. In Quebec, 2016 mortality monitoring estimated that 46% of all bat mortalities were Hoary Bat. Across Canada, 34% of all fatalities are of Hoary Bats (Zimmerling and Francis 2016, as cited in COSEWIC 2023, IN PRESS). Across North America, Hoary Bats have been documented in mortality monitoring at 95% of project sites that reported data (AWWI 2018, as cited in COSEWIC 2023, IN PRESS). For Hoary Bats it is considered likely that 71-100% of Hoary Bats in Canada will encounter a wind turbine in the next 3 generations, which an extreme to serious population decline predicted at 31-70% of the population. Projected increase in wind development in North America is expected to continue to contribute to the decline of the species.

Next threats identified from highest to least/unknown level of threat are a decline in prey availability (medium to high impact), pollution (low to medium impact), loss of roosting habitat (low impact), and climate change (unknown).

Accidents during migration include wind turbine mortality, weather events, and predation. Cumulatively considering the threats, the overall threat for this species is Very high to High.

Specific locations are not identified but are considered to be more than 10 (COSEWIC 2023, IN PRESS).

2.6. Specialized life history or habitat use characteristics

Being a migratory species increases vulnerability, and in particular to wind turbines. Mating strategies for this species relies on solitary males and females finding mates along migratory routes, which may become increasingly more difficult in declining populations (COSEWIC 2023, IN PRESS). There is some evidence that they use a relatively small summer home range and return to it.

2.7. Existing Conservation and Recovery Actions

Migratory bats and specifically Hoary Bat is likely to occur in likely all of the protected areas in Canada. It is unknown if the protected area network alone would meet the habitat needs for this species.

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Multiple lines of evidence for A2be + 3be + 4be where population reductions are estimated at greater than 50% percent, with some assumptions. Threats are considered significant and ongoing.

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Does not apply. The range in Canada exceeds EOO and IAO thresholds.

3.1.3. Criterion C – Small and declining number of mature individuals

The Hoary Bat population is estimated at 2.25 million across North America, with up to 50% of those bats considered plausibly in Canada during the summer. Does not apply.

3.1.4. Criterion D – Very small or restricted total population

Does not apply.

3.1.5. Criterion E – Quantitative analysis

Meets criteria for Endangered. Population viability analysis modelling estimates the probability of extinction of at least 20% by 2050 (30 years or 3 generations) (COSEWIC 2023, IN PRESS).

3.2. Application of Special Concern in Ontario

Not applicable.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Does not apply as a modifier. The species is classified as G3 globally. Ontario's conservation responsibility is considered less than 25%.

3.3.2. Status modification based on level of risk in broader biologically relevant geographic range

Does not apply. Hoary Bat is projected to decline throughout its range in Canada and similar threats experienced across the global range.

3.3.3. Rescue Effect

Rescue effect is considered unlikely (COSEWIC 2023, IN PRESS) as US populations are considered to face greater severity of threat than in Canada.

3.4. Other status categories

3.4.1. Data deficient

Not applicable. Multiple lines of evidence were used to assess threat and status.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

Hoary Bat (*Lasiurus cinereus*) is classified as endangered in Ontario based on meeting criterion A2be + 3be + 4be and E.

5. Information sources

COSEWIC. 2023. COSEWIC assessment and status report on the Hoary Bat *Lasiurus cinereus*, Eastern Red Bat *Lasiurus borealis* and the Silver-haired Bat *Lasionycteris noctivagans*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 101 pp. (<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>).

Davy, C.M., K. Squires, and J.R. Zimmerling. 2020. Estimation of spatiotemporal trends in bat abundance from mortality data collected at wind turbines. *Conservation Biology* 35:227-238.

NatureServe Explorer. 2023. *Lasiurus cinereus*, Hoary Bat. Available at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.103130/Lasiurus_cinereus [accessed on 11 November 2023].

Ontario Ministry of Natural Resources. 2023. Natural Heritage Information Centre. <https://www.ontario.ca/page/get-natural-heritage-information> Accessed on November 11, 2023.

Appendix 1: Technical summary for Ontario

Species: Hoary Bat (*Lasiurus cinereus*)

Demographic information

Demographic attribute	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	2-6 years estimated
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Yes, inferred
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Not available.
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Greater than 70% based multiple lines of evidence (90.5% decline inferred based on observed 21% annual declines in fatality rates over the past 7 years ~1 generation)
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Projected reduction: Greater than 70% based on multiple lines of evidence and threats impacts
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Suspected to be >70% decline, based on observed, inferred, and projected mortality
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Partially b. Yes c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	Unknown but likely $\geq 2,000,000$ km ²
Index of area of occupancy (IAO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	Unknown but likely $\geq 100,000$ km ²

Extent and occupancy attributes	Value
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy in habitat patches that are: (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. No
Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i>	Locations are estimated at more than 10.
Number of NHIC Element Occurrences <i>Request data from MNRF.</i>	Not available
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Unknown
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Unknown
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	No
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/Inferred decline in quality of habitat
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	Unknown
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of mature individuals in each sub-population or total population (if known)

Sub-population (or total population)	Number of mature individuals
Total population	Unknown but estimated at 2.25 million in US and Canada, with about 50% of those bats plausibly in Canada during summer. Unknown but likely in the order of 1.13 million mature individuals in Canada during summer

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is 22% in 100 years as assessed through population

viability analysis modelling. An additional more recent analysis indicates an estimate of 0-40% by 2050 based on various build out scenarios and mid-point of 20%.

Threats

A threats calculator completed for this species in August of 2021 (COSEWIC 2023, IN PRESS).

Overall threat impact is Very High to High with threats from highest to least impact:

- i. Energy production & mining (IUCN 3) – very high - high impact
- ii. Natural system modifications (IUCN 7) – high - medium impact
- iii. Pollution (IUCN 9) – medium – low impact
- iv. Agriculture & aquaculture (IUCN 2) - low impact
- v. Transportation & service corridors (IUCN 4) – low impact
- vi. Biological resource use (IUCN 5) – low impact

Rescue effect

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes
Status of outside population(s) most likely to provide immigrants to Ontario	Insert status
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possible
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Yes, likely
Is the species of conservation concern in bordering jurisdictions?	Yes, in part
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	No, COSEWIC (2023) indicated that populations in the US are likely facing greater severity of threats than in Canada.

Sensitive species

No

Acronyms

COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ESA: Endangered Species Act
EO: Element occurrence (as defined by NHIC)
EOO: extent of occurrence
GRANK: global conservation status assessments
IAO: index of area of occupancy
IUCN: International Union for Conservation of Nature and Natural Resources
MNRF: Ministry of Natural Resources and Forestry
NHIC: Natural Heritage Information Centre
NNR: Unranked
NRANK: National conservation status assessment
SARA: Species at Risk Act
SNR: unranked
SRANK: subnational conservation status assessment
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
IUCN: International Union for Conservation of Nature and Natural Resources
CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario