COSEWIC
Assessment and Status Report

on the

Common Nighthawk
Chordeiles minor

in Canada

SPECIAL CONCERN
2018

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:

COSEWIC. 2018. COSEWIC assessment and status report on the Common Nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 50 pp. (http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1).

Previous report(s):

COSEWIC 2007. COSEWIC assessment and status report on the Common Nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 25 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Production note:
COSEWIC would like to acknowledge Andrew Gregg Horn for writing the status report on Common Nighthawk, *Chordeiles minor*, prepared under contract with Environment and Climate Change Canada. This report was overseen and edited by Richard Elliot, Co-chair of the COSEWIC Birds Specialist Subcommittee.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur L'engoulevent d'Amérique (*Chordeiles minor*) au Canada.

Cover illustration/photo:
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Catalogue No. CW69-14/515-2018E-PDF
ISBN 978-0-660-27850-6

COSEWIC
Assessment Summary

Assessment Summary – April 2018

Common name
Common Nighthawk

Scientific name
Chordeiles minor

Status
Special Concern

Reason for designation
This aerial insectivore is a widespread breeding bird across southern and boreal Canada. Its population in southern Canada has declined by 68% since 1970, but the rate of decline has slowed appreciably over the past decade, and the species appears to be quite abundant in suitable boreal habitats. Concerns remain over the effects of human activities and changing climates in reducing food and nest-site availability. The causes of decline are not well known, but include threats that reduce the numbers of aerial insects on which this species forages, which can be attributed to agricultural and other pesticides, and changes in precipitation, temperature and hydrological regimes. An increasing frequency of severe or extreme weather events is also likely impacting this species by reducing its productivity and increasing mortality.

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

Status history
Designated Threatened in April 2007. Status re-examined and designated Special Concern in April 2018.

COSEWIC
Executive Summary

Common Nighthawk
Chordeiles minor

Wildlife Species Description and Significance

Common Nighthawk (*Chordeiles minor*) is the most frequently seen member of the nightjar family. It pursues and catches flying insects on the wing, and is most active from dusk to dawn. It is extremely well-camouflaged by its mottled brown plumage when perched on the ground or horizontal surfaces. Common Nighthawk is most often seen in flight, when it can be recognized by its distinctive bounding flight, white bar near the end of the wing, and nasal *peent* call.

Distribution

The species breeds across Canada, as far north as central Yukon and southwestern Northwest Territories in the west, and slightly north of the Boreal Shield in the east. It breeds throughout the contiguous United States and locally south into Central America. It winters in South America, mainly in the lowlands east of the Andes Mountains.

Habitat

Common Nighthawk breeds in a range of open and partially open habitats, including forest openings and post-fire habitats, prairies, bogs, and rocky or sandy natural habitats, as well as disturbed areas. It is also found in settled areas that meet its habitat needs, those with open areas for foraging and bare or short-cropped surfaces for nesting. The species' use of a wide range of habitats makes it difficult to estimate trends in habitat availability, except in urban habitats, where their main nesting sites – flat graveled roofs – are disappearing.

Biology

Common Nighthawk can breed by its second year, lays 1-2 eggs, and raises one brood per year. The limited data available on longevity suggest it lives for 4-5 years on average, with a generation time of about 2-3 years. Other key demographic variables, such as survival rates and site fidelity, are poorly known. Survival and reproduction of individuals are thought to be constrained by the availability of flying insects on which to forage.

Population Sizes and Trends

Population size estimates are poor, because Common Nighthawk is difficult to detect during most of the day, and much of its boreal habitat is not well-surveyed. The Canadian population is estimated from Breeding Bird Survey (BBS) results as 900,000 adults, about 10% of the global population. The Boreal Avian Modelling project, which collects data from additional sources in the northern parts of the breeding range, estimates a population of 270,000 adults in Canada, although this value is likely an underestimate. The BBS provides the best available information on population trends, especially in southern Canada. It shows that numbers there declined by 68% between 1970 and 2015, and that the rate of decline has slowed appreciably to 12% over the 10-year period 2005-2015. Analysis of eBird records suggests that the population may have stabilized in recent years, and the species appears to be quite abundant in suitable boreal habitats.

Threats and Limiting Factors

Widespread threats that may have an important impact include reduced abundance of aerial insects due to effects of agricultural and other pesticides, changes in precipitation and hydrological regimes, changes in temperature regimes, and increasing frequency of severe or extreme weather events. Several other threats have been proposed, but appear to be less severe or affect only a small proportion of the population.

Protection, Status and Ranks

Common Nighthawk and its nests are protected under the *Migratory Birds Convention Act,* 1994, and the species is listed as Threatened under Schedule 1 of the *Species at Risk Act*. A national recovery strategy has been developed to address key threats, close knowledge gaps and identify critical habitat. The species is ranked as Not at Risk globally (G5), Apparently Secure (N4B) in Canada and Secure (N5B) in the United States. However, it is considered as Critically Imperilled (S1), Imperilled (S2), or Vulnerable (S3) in 14 of 48 states and nine of 13 provinces and territories in which it occurs. In the remaining provinces (British Columbia, Alberta, Saskatchewan, and Ontario) it is ranked Apparently Secure (S4) or Secure (S5).

TECHNICAL SUMMARY

Chordeiles minor

Common Nighthawk

Engoulevent d'Amérique

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

Demographic Information

Generation time (average age of parents in the population)	2-3 years.
Is there a continuing decline in number of mature individuals?	Yes, inferred from Breeding Bird Survey and Boreal Avian Modeling Project analyses (see **Fluctuations and Trends** Section).
Estimated percent of continuing decline in total number of mature individuals within 5 years.	Unknown.
Estimated percent reduction in total number of mature individuals over the last 10 years.	12% estimated reduction over 10 years (BBS: 2005-2015, 95% CI limits: -34%, +17%), especially in southern Canada.
Suspected percent change in total number of mature individuals over the next 10 years.	Unknown.
Suspected percent change in total number of mature individuals over any 10-year period, over a time period including both the past and the future.	Unknown.
Are the causes of the decline: a. clearly reversible, and b. understood, and c. ceased?	a. Unknown. b. No. c. Unknown.
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	8,971,820 km².
Index of area of occupancy (IAO) (Always report 2x2 grid value).	Not estimated, because distribution at 2X2 grid scale is uncertain, but >> 2,000 km².
Is the population "severely fragmented" i.e., is >50% of its total area of occupancy in habitat patches that are: a. smaller than would be required to support a viable population, and b. separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No. b. No.

Number of “locations”.	Unknown, but far greater than the threshold of 10 locations.
Is there an observed, inferred, or projected decline in extent of occurrence?	No decline in EOO.
Is there an observed, inferred, or projected decline in index of area of occupancy?	Unknown.
Is there an observed, inferred, or projected decline in number of subpopulations?	Not applicable.
Is there an observed, inferred, or projected decline in number of “locations”?	Unknown.
Is there an inferred decline in the extent and/or quality of habitat?	Yes, inferred decline in the quality of habitat in some areas.
Are there extreme fluctuations in number of subpopulations?	Not applicable.
Are there extreme fluctuations in number of “locations”?	No.
Are there extreme fluctuations in extent of occurrence?	No.
Are there extreme fluctuations in index of area of occupancy?	No.

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	**N Mature Individuals**
Total	Minimum of 270,000, based on BAM data (see **Abundance** section).

Quantitative Analysis

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

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

Was a threats calculator completed for this species?

Yes, on 14 February 2017, by: Louise Blight, Kim Borg, Mark Brigham, Mike Burrell, Stephen Davis, Bruno Drolet, Richard Elliot, Dave Fraser (Facilitator), Marcel Gahbauer, Shelley Garland, Robin Gutsell, Kevin Hannah, Megan Harrison, Nathan Hentze, Andy Horn, Jessica Humber, Joanna James (COSEWIC Secretariat), Elly Knight, Elsie Krebs, Dwayne Lepitzki, Greg Mitchell, Karolyne Pickette, Emily Rondel, Rich Russell, Mary Sabine, Pam Sinclair, Peter Thomas, Liana Zanette

The assigned overall threat impact is High-Low, and the following contributing threats were identified, listed in decreasing order of severity:

7.3 Other ecosystem modifications (High-low)
1.1 and 1.2 Residential and commercial development (Negligible)
2.1 and 2.3 Agricultural (non-timber) crops, livestock farming and ranching (Negligible)
4.1 Transportation and service corridors - roads and railroads (Negligible)
7.2 Dams and water management and use (Negligible)
8.1 Invasive non-native or alien species and diseases (Negligible)
8.2 Problematic species/diseases (Negligible)
9.6 Excess energy (light pollution) (Negligible)
7.1 Fire and fire suppression (Unknown)
9.3 Agricultural and forestry effluents (Unknown)
9.5 Air-borne pollutants (Unknown)
11. Climate change and extreme weather (Unknown)

Limiting factors: Common Nighthawk's tightly constrained energy budget and its strong reliance on availability of aerial insects increase its vulnerability to threats that affect survival. Its long-distance migration and restricted breeding season, combined with the small clutch size, limit its annual productivity and potential rate of population recovery.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Declining populations in adjacent US states.
Is immigration known or possible?	Yes.
Would immigrants be adapted to survive in Canada?	Yes.
Is there sufficient habitat for immigrants in Canada?	Yes.
Are conditions deteriorating in Canada?	Unknown.
Are conditions for the source population deteriorating?	Yes.
Is the Canadian population considered to be a sink?	Unknown.
Is rescue from outside populations likely?	No.

Data Sensitive Species

Is this a data sensitive species? No.

Status History

COSEWIC: Designated Threatened in April 2007. Status re-examined and designated Special Concern in April 2018.

Status and Reasons for Designation:

Status: Special Concern	Alpha-numeric codes: Not applicable
Reasons for designation: This aerial insectivore is a widespread breeding bird across southern and boreal Canada. Its population in southern Canada has declined by 68% since 1970, but the rate of decline has slowed appreciably over the past decade, and the species appears to be quite abundant in suitable boreal habitats. Concerns remain over the effects of human activities and changing climates in reducing food and nest-site availability. The causes of decline are not well known, but include threats that reduce the numbers of aerial insects on which this species forages, which can be attributed to agricultural and other pesticides, and changes in precipitation, temperature and hydrological regimes. An increasing frequency of severe or extreme weather events is also likely impacting this species by reducing its productivity and increasing mortality.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Estimated rate of reduction in total number of mature individuals does not meet thresholds.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. EOO and IAO exceed thresholds.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Total number of mature individuals exceeds thresholds.
Criterion D (Very Small or Restricted Population): Not applicable. Total number of mature individuals and area of occupancy exceed thresholds.
Criterion E (Quantitative Analysis): Analysis not conducted.

PREFACE

Since the previous status report, Common Nighthawk population size and trends based on the Breeding Bird Survey have been re-estimated using new methods (Smith *et al*. 2014; Rosenberg *et al*. 2016). The species' distribution and abundance in the less-surveyed northern portion of its range is better understood as a result of new surveys and analyses (Barker *et al*. 2015; Environment Canada 2016; Center for Conservation Biology 2017; Knight 2017). New analyses of trends from eBird records are now available (Walker and Taylor 2017), to complement those from BBS and the Boreal Avian Modelling program (Haché *et al*. 2014).

In addition, recent studies have provided information on several aspects of the biology of Common Nighthawk, such as nesting habitat and nest success (Ng 2009; Lohnes 2010; Allen and Peters 2012; Kramer and Chalfoun 2012), characteristics of breeding (Haché *et al*. 2014; Newberry and Swanson 2016; Farrell *et al*. 2017; Knight *et al*. *submitted*), migration and wintering habitats (Ng *et al*. 2017), and certain threats, such as predation (Latta and Latta 2015) and collisions (Fense *et al*. *submitted*). Some new information on the threats faced by other members of the nightjar family (e.g., English *et al*. 2017) and aerial insectivores more generally (e.g., Nebel *et al*. 2010; Nocera 2012, 2014) also applies to threats to Common Nighthawk. Much of the new research on this species has been synthesized and related to the species' status in the revised Birds of North America species account (Brigham *et al*. 2011) and the Canadian Recovery Strategy for this species (Environment Canada 2016).

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 (2018)

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

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

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

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

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

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Scientific Name: *Chordeiles minor*
English Name: Common Nighthawk
French Name: Engoulevent d'Amérique
Classification: Class: Aves, Order: Caprimulgiformes, Family: Caprimulgidae

Two other species of the genus *Chordeiles* occur in North America: Lesser Nighthawk, *C. acutipennis*, which breeds in southwestern U.S. and Mexico, and Antillean Nighthawk, *C. gundlachii*, which breeds on islands of the Caribbean Sea, and which was considered a subspecies of *C. minor* until 1982 (Guzy 2002).

Morphological Description

Common Nighthawk is a member of the nightjar family, which comprises well-camouflaged birds, such as Eastern Whip-poor-will (*Antrostomus vociferus*), that feed on flying insects and are mainly crepuscular (active at dawn or dusk) or nocturnal (active at night).

Common Nighthawk is 22–24 cm in length with a mass of 65–98 g (Brigham *et al*. 2011), roughly the size of American Robin (*Turdus migratorius*), but with longer, pointed wings, and a more slender and elongated build. It is most often seen flying near dusk or dawn, when it is easily recognized by its distinctive bounding, halting flight, the white bar near the end of each wing, and far-carrying nasal *peent* call. Like other members of the nightjar family, its broad mouth is specialized for scooping insects in flight. When at rest, its plumage is cryptically mottled brownish-grey and black like other nightjars, although its distinctive white wing bar may be visible on the folded wing.

The only other nightjars that breed in Canada are Eastern Whip-poor-will, which breeds throughout southern Canada, Chuck-will's-widow (*A. carolinensis*), which breeds occasionally in extreme southern Ontario, and Common Poorwill (*Phalaenoptilus nuttallii)*, which breeds in southern British Columbia, Alberta, and Saskatchewan. None of these are likely to be confused with nighthawks when in flight, as all have rounded wings and moth-like wingbeats that are quite different from the pointed wings and jerking wingbeats of nighthawks.

Population Spatial Structure and Variability

Three subspecies of Common Nighthawk are recognized in Canada: the widespread *Chordeiles minor minor*, the greyer *C. m. hesperis* found from southeastern British Columbia east to southwestern Saskatchewan, and the pale *C. m. sennetti* of southern Saskatchewan and southern Manitoba (American Ornithologists' Union [AOU] 1957). Variation in Canadian birds has not been studied, and the distribution of each subspecies is not thoroughly understood. Differences in plumage and morphology across these

subspecies through the U.S. appear to be continuous (Brigham *et al*. 2011), and a comparison of nuclear and mitochondrial DNA showed no clear genetic differences across the subspecies (Sigurðsson and Cracraft 2014).

Designatable Units

Despite the presence of three subspecies of Common Nighthawk in Canada, separated on the basis of minor differences in plumage colouration, there is no evidence for discrete genetic or morphological differences among them (Brigham *et al*. 2011). Differences among the subspecies are insufficiently discrete and evolutionarily significant for them to be considered separately, so the species is treated here as one designatable unit.

Special Significance

Common Nighthawk is the most frequently observed nightjar in North America, and the only one that breeds across the continent. Crepuscular and nocturnal birds are particularly appreciated for their wild and mysterious qualities, and Common Nighthawk is one of few such species to fill this niche in urban environments (Coll 2013). Aerial insectivores such as nighthawks serve essential ecological functions and are key indicator species, because they rely on flying insects, which are ecologically important and poorly monitored.

DISTRIBUTION

Global Range

Common Nighthawk breeds throughout the contiguous United States and Canada south of the tree line, except in insular Newfoundland and the far southwest of the United States (Figure 1). Its breeding distribution also includes the western Sierra Madre and Gulf Coast of Mexico, and extends discontinuously south through Central America.

This species crosses much of North America on migration, and large numbers pass through Florida and Cuba in the fall and again in the spring, with many birds flying directly across the Gulf of Mexico and Caribbean Sea (Brigham *et al*. 2011). Five of seven males fitted with satellite tags at breeding sites in northeastern Alberta completed a full annual cycle to wintering grounds and back to Alberta. They followed routes in the fall through prairie Canada, the southeastern US and Cuba, making landfall in Colombia and on to central Brazil. All passed again directly across the Gulf of Mexico in spring, then following a slightly more westerly route through the central US (Ng *et al*. 2017).

The exact range of Common Nighthawk outside North America is uncertain, because of limited search coverage and possible confusion with southern species of nighthawks. It may winter throughout the northeastern half of South America (Figure 1), but most winter records come from the South American Lowlands, specifically eastern Peru, eastern

Ecuador, and southern Brazil, south to central Peru, northeastern Uruguay and northeastern Argentina (Brigham *et al*. 2011). Seven males fitted with GPS tags on their Alberta breeding grounds all wintered in the Amazon and Cerrado regions of central Brazil (Ng *et al*. in preparation).

Figure 1. Breeding, migrating and wintering range of Common Nighthawk (from Environment and Climate Change Canada 2016). As illustrated here, the northern edge of the range in Yukon is slightly too far south (by about 150 km; Sinclair pers. comm. 2017) and is uncertain in the Northwest Territories and Nunavut (see text).

Canadian Range

Common Nighthawk breeds in central and southern Yukon (north to the Dawson area; Sinclair *et al*. 2003), southwestern Northwest Territories, throughout British Columbia (except Haida Gwaii and the adjacent outer Pacific coast), Alberta, and Saskatchewan. From Manitoba east, its range largely coincides with the Boreal Plains and Boreal Shield, including most of Manitoba and Ontario, Québec and Labrador south of the 55th parallel, and all of the Maritime Provinces (Figure 1). Although often reported as not occurring in Nunavut (e.g., Environment Canada 2016), there are nesting records of this species on Nunavut islands in James Bay, including Charlton and Akimiski Islands (eBird 2016; Richards pers. comm. 2016), and it may also occur in southern mainland Nunavut. Indeed, the northern limit of the species' breeding range in the Northwest Territories and Nunavut is uncertain, because of limited search effort.

Extent of Occurrence and Area of Occupancy

The extent of occurrence (EOO) in Canada is 8,971,820 km² The index of area of occupancy (IAO) could not be calculated, because its distribution at the 2x2 grid scale is uncertain, but it is appreciably greater than 2,000 km^2 (Beaulieu pers. comm. 2016).

Search Effort

The distinctive appearance and habits of Common Nighthawk make it noticeable and easily recognized, so its breeding distribution in inhabited and regularly searched areas is well known. However, the sparsely settled northern half of its breeding range in Canada is poorly searched. Thus trend estimates from this area to the northern limits of its breeding range are currently uncertain, although they are becoming clearer as northern surveys targeting this species expand (Knight 2017). The database provided by eBird (2016), in which naturalists worldwide enter records of birds they have seen or heard, has recently grown exponentially, providing improved information on the species' distribution (Environment Canada 2016; Walker and Taylor 2017). Population trends are available from this database and from the systematic surveys discussed in **Sampling Effort and Methods**, below.

As noted in **Global Range**, above, there is limited observer coverage on the wintering range of the species, and difficulty in distinguishing Common Nighthawks there from individuals of other southern species in the same genus.

HABITAT

Habitat Requirements

Common Nighthawk breeds in a wide variety of habitats that provide open areas for foraging in flight, and bare ground with nearby shade, for nesting. Breeding habitat includes open forests, especially those with cuts, burns, or rock outcrops (Farrell *et al*. 2017; Weeber *et al.* unpublished ms), prairie with short grass or bare patches, dry bogs, rocky areas (such as quarries, gravel pits, and bedrock outcrops), sandy coastal habitats, and settled areas that resemble the natural areas mentioned above, such as railways, gravel roads, airports, cultivated fields, orchards, parks, urban areas with gravel roofs, oil-well pads, and pipelines (Brigham *et al*. 2011; Knight pers. comm. 2017). In prairie regions, the species occurs more in grassland than cropland, especially areas with short grass, few shrubs, and a nearby source of water (Pidgeon *et al*. 2001; McLachlan 2007; Ng 2009). In boreal regions, where a large proportion of the Canadian population breeds, outcrops and post-burn habitats may provide important nesting areas (Farrell *et al*. 2017; Weeber *et al.* unpublished ms).

Microhabitat requirements for Common Nighthawk nesting are more specific and better understood. Nests are typically in open sites with dry, well-drained substrates that will not overheat and that have shade nearby for young to shelter from the sun and predators (Ng 2009; Lohnes 2010; Brigham *et al*. 2011; Allen and Peters 2012). Nest sites include forest clearings, bare patches in grassland, gravel pits, outcrops, road or rail sides, and, rarely, fenceposts (Brigham *et al*. 2011). In urban environments, which comprise a relatively small portion of their Canadian range, nighthawks nest almost exclusively on roofs covered with pea gravel that have a source of shade, such as a parapet (Marzilli 1989). Nighthawk nestlings are semiprecocial i.e., newly hatched young are downy, with open eyes and some capability of leaving the nest, and they often move well away from the nest site daily (up to 48 m), increasingly so as they age (Allen and Peters 2012; Kramer and Chalfoun 2012).

The availability of suitable roosting sites may be another important habitat requirement for Common Nighthawk. While a broad range of sites is used, including the ground, tree limbs, rooftops, and fenceposts, repeated use of particular sites suggests that key features are required, including unobstructed flight paths, shade from the sun, and camouflage (Fisher *et al*. 2004; Campbell *et al*. 2006).

The area of habitat needed for breeding varies widely across studies. Across 56 burns, clear cuts and open wetlands in northwestern Ontario, the presence of nighthawks did not vary with patch size, although none were found in the three patches smaller than 3 ha (Farrell *et al*. 2017). Males defend territories from as small as 1.5 ha in northeastern Alberta (Knight pers. comm. 2017), to 10 ha in several urban studies, to 28 ha in some non-urban (field) habitats in Saskatchewan (Brigham *et al*. 2011). However, home ranges may be much larger, with separate areas for roosting and foraging that may be up to 6 km from the nest site (Ng 2009).

Common Nighthawk appears to be an opportunistic generalist in its choice of foraging habitats, often aggregating in areas that attract concentrations of flying insects, such as waterways and lighted areas (Brigham *et al*. 2011). It may rely more on wetlands when breeding in grassland habitats in southern Canada, where it feeds on a wide range of flying insects, than in boreal habitats, where it may feed mainly on beetles from terrestrial sources (Knight *et al*. *submitted*). Its tendency to follow waterways during migration may increase foraging efficiency, and the synchronous timing of its brief fall migration with the emergence of flying ants may indicate a reliance on that food source at that time (Poulin *et al*. 1996).

Data on wintering habitats are scant (Brigham *et al.* 2011), although five satellite-tagged males had winter home ranges with a mean (± standard error) of 148±121 ha that were primarily in disturbed areas, such as agricultural areas, and included varying amounts of forest, grassland, and cropland (Knight pers. comm. 2017; Ng *et al*. in prep.).

Habitat Trends

Habitat trends are difficult to estimate, as Common Nighthawk uses such a wide variety of habitat types and several of these are changing rapidly within the species' range. For example, the boreal transition zone in Saskatchewan has historically lost 73% of its forest cover to clearing, with 25% lost between 1966 and 1994 (Hobson *et al*. 2002). Similar losses have been documented at the interface of the southern boreal mixedwood and aspen parkland in Alberta (Young *et al*. 2006). Overall, Canada's prairie regions have lost most of their native grassland to planted grass and cropland, including a 10% loss between 1985 and 2001 (Watmough and Schmoll 2007). Expansion of agricultural land has leveled off in recent decades, although agricultural intensification, such as increased farm area and growth in high-input, high-yield crops, including corn and soybeans, is continuing in western Canada and much of the U.S.A. (Smith 2015). Deforestation and agricultural intensification is occurring throughout most of the species' wintering range (Arroyo *et al*. 2009).

However, the net effect of these changes on Common Nighthawk habitat is unclear, because the relative importance of suitable habitat types is poorly understood. In particular, it is uncertain whether the availability of food, nest sites, or other factors limits the population during breeding, migration, or wintering. For example, while forest clearing or grassland conversion may reduce the availability of insects, it may also increase the availability of nest sites (Environment Canada 2016). Nesting habitats are declining in urban areas, where the species nests almost exclusively on flat roofs covered with small gravel, as these are being rapidly replaced through new construction practices (Baskaran *et al*. 2007; Coll 2013). However, these areas comprise a relatively small proportion of the species' breeding range in Canada. Across the boreal forest, which comprises most of the Canadian range of Common Nighthawk, wildfires are increasing, exposing new nesting habitat and causing peaks in the abundance of insect food, notably beetles (Perera and Buse 2014; Natural Resources Canada 2016). Weeber *et al.* (unpublished ms) noted the affinity of Common Nighthawk for post-fire habitats, and the relatively high abundance of this species in suitable boreal habitats exposed to fire in northern Ontario.

BIOLOGY

Recent studies have increased our knowledge of Common Nighthawk behaviour and habitat use (e.g., Brigham *et al*. 2011; Allen and Peters 2012; Kramer and Chalfoun 2012), although key aspects of its demography are still unknown, and knowledge of its biology during migration and wintering is particularly poor.

Life Cycle and Reproduction

The lifespan of Common Nighthawk is unknown, although individuals are thought to live 4-5 years on average (Brigham *et al*. 2011). In the absence of further information, the average age of the adult population is estimated here as 2-3 years (following COSEWIC 2007). The age of first breeding is unknown (Brigham *et al*. 2011), but is presumed to be one year. This species is monogamous, laying a clutch of up to two eggs, and, because it is a long-distance migrant, raises only one brood per season (Brigham *et al*. 2011). In Canada, the egg and nestling stages generally extend from late May to early August (Rousseu and Drolet 2017).

Nests can fail from effects of hot or cold temperature extremes, flooding, or predation (Brigham *et al*. 2011). Nesting success is particularly hard to estimate in this species, because the altricial chicks often move away from the nest (Allen and Peters 2012; Kramer and Chalfoun 2012). It varied among four studies (one across several prairie states and provinces, and the others in New Jersey, Florida, and Alberta, each with sample sizes of 14-23 nests). Nesting success rates ranged from 43% to 93%, and predation (by unknown sources, but presumably several predator species) was the main cause of nesting failure (Kantrud and Higgins 1992; Perkins and Vickery 2007; Allen and Peters 2012; E.C. Knight, unpubl. data). Juvenile and adult return rates are poorly known, although females have been known to return to nest sites for up to 5 years in a row (Brigham *et al*. 2011).

Physiology and Adaptability

Common Nighthawk physiology and life history are strongly linked to the availability of flying insects. This is particularly true during peaks in energy needs, such as chick-rearing and migration, when a change in insect availability, or in the timing of peaks in insect abundance, can have a disproportionate effect on energy budgets. The timing of these periods is particularly important in this species, because its long-distance migration restricts it to a relatively short breeding season (Brigham *et al*. 2011). Also, while many nightjars are able to go into torpor (a hibernation-like state of reduced metabolism) to survive periods of scarce food or cold weather, Common Nighthawks rarely do so (Firman *et al*. 1993; Fletcher *et al*. 2004).

Common Nighthawk may use disturbed, even highly urbanized habitats, but its flexibility is constrained by its need for a supply of flying insects for foraging, and specific nest-site features (Brigham *et al*. 2011). In urban environments, where habitats providing flying insects and appropriate nest-site characteristics can be easily characterized (by

artificial lighting and gravel roofs, respectively), their presence has been directly attributed to those features (Brigham *et al*. 2011). Similar constraints likely operate in other environments, although they are harder to characterize, making the species appear to be more of a habitat generalist.

Dispersal and Migration

Common Nighthawk is a long-distance migrant, summering in North America and wintering in South America. A relatively small sample of seven males, fitted with satellite tags where they bred in northeastern Alberta, all followed similar direct routes on spring migration to winter in the Amazon and Cerrado regions of central Brazil (Ng *et al*. in preparation), suggesting a degree of migratory connectivity. Most crossed the Gulf of Mexico and Caribbean Sea in both spring and fall, when a similar route was followed, with some birds stopping briefly in Florida, Cuba and Colombia. In Canada, nighthawks arrive in spring between early May and early June, making them among the last migrant landbirds to return. In fall, they depart on southbound migration between mid-August and mid-September (Weir 1989; Manitoba Avian Research Committee 2003; COSEWIC 2007).

Although nighthawks migrate singly in the spring, in the fall migrating flocks of a few to thousands of birds pass over particular sites (COSEWIC 2007; Brigham *et al*. 2011), suggesting that specific landscape features or habitat characteristics are optimal for flight efficiency or for foraging during migration. Larger flocks may be associated with certain rivers or coastlines (Brigham *et al*. 2011), and their appearance across large areas may coincide with the passage of cold fronts (e.g., Coady 2007). Fall migration peaks over a narrow time window in late August, perhaps coinciding with the emergence of flying ants (Poulin *et al*. 1996; Coady 2007; COSEWIC 2007).

Natal and breeding dispersal within and between breeding seasons is also poorly understood. A few studies show that at least some adults return to the same nest site for up to five years (Brigham *et al*. 2011), and one study from northeastern Alberta showed that ten males returned to breed within 1 km of their previous territory (Knight pers. comm. 2017).

Interspecific Interactions

Common Nighthawk competes for aerial insects with other crepuscular aerial foragers. It has been recorded acting aggressively toward Chuck-will's-widow, actively excluded from territories of Lesser Nighthawk (*C. acutipennis*), and displaced from feeding areas by bats (Brigham *et al*. 2011).

Eggs and nestlings are vulnerable to a wide range of mid-sized predators, including corvids, gulls, raptors, domestic dogs and other canids, skunks, Raccoons (*Procyon lotor*), opossums, and snakes (Brigham *et al*. 2011). Predators of adults are undocumented, apart from anecdotal accounts of predation by cats and raptors (Brigham *et al*. 2011).

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

The largest-scale information on Common Nighthawk population trends comes from the Breeding Bird Survey (BBS), in which volunteer observers record all birds encountered on early mornings from late May to early July during three-minute stops along roadside routes distributed throughout the United States and much of southern and central Canada (Downes *et al*. 2005, 2016).

Breeding Bird Surveys start 30 minutes before sunrise and continue for 4-5 hours thereafter, suggesting that only observations at the first few survey stops would be likely to detect this species, given its crepuscular behaviour (Knight pers. comm. 2017). For example, only one Common Nighthawk was counted along three BBS routes conducted in 2014 in the Northwest Territories. However, 46 individuals were counted during a survey conducted the previous evening near sunset, using automated recording units deployed at half the BBS stops (Haché pers. comm. 2016). Also, few BBS routes are located in boreal regions where much of the Canadian population breeds (Van Wilgenburg *et al*. 2015). Even within boreal regions, BBS routes may under-sample nighthawk habitat; recent surveys targeting burnt areas in northern Ontario forests detected nighthawks at 46-84% of sampled sites, in contrast to less than 3% on comparable randomly selected BBS routes (Weeber *et al*. unpublished ms). BBS coverage of the Boreal Softwood Shield has improved since the last status report, and recent analyses of rolling 10-year trends, i.e., trends calculated across 10-year periods centred on successive years (see **Population Sizes and Trends**, below) could include only four routes for 2005, but 12 routes for 2015 (A. Smith, unpubl. data). However, coverage of the Boreal Taiga Plains has not improved (28 routes for 2005, 25 routes for 2015).

Since the last Common Nighthawk status assessment (COSEWIC 2007), new Bayesian analytical procedures have been used to calculate population trends from BBS data. These methods are a particular improvement for data-sparse and boreal-distributed species like Common Nighthawk, as the newer model gives more weight to northern routes, better represents the spatial variation in abundance and trends across the country in generating the national trend estimate, is less sensitive to variations in sampling effort among years, and is conservative in estimating changes in short-term trends (A.C. Smith pers. comm. 2017).

To provide better information on bird abundance in the boreal zone, the Boreal Avian Modelling Project (BAM) has been assembling morning point count data from over 100 projects, including the BBS, conducted in the boreal and hemi-boreal region of North America since 1990 (Haché *et al*. 2014). BAM statistically adjusts the data for methodological differences among projects, and uses the adjusted data for habitat modeling and trend estimation (Sólymos *et al*. 2013; Barker *et al*. 2015). In addition to the roadside BBS data, BAM includes many point counts that are conducted well away from roads, so its results may be less affected by roadside biases in detection of, or occupancy by, Common Nighthawk (Haché *et al*. 2014; see also Van Wilgenburg *et al*. 2015).

Unlike BBS and BAM, the eBird database (see **Search Effort**, above) provides broad coverage of the species' range and is not tied to a strict sampling regime. It is unknown whether that makes its sampling biases worse or better than those of systematic surveys. However, screening eBird data for a minimal level of effort and then statistically controlling for indirect measures of search effort has yielded trend estimates that mirror BBS data for many species (Walker and Taylor 2017). Thus eBird data might be a useful source of trend estimates where BBS trends are subject to biases, as may be the case for Common Nighthawk.

Provincial or regional breeding bird atlases, in which volunteers search for breeding evidence of all species within a region over a five-year period, also provide trend information. Atlassers make special efforts to search all habitats at all times of day, and thus gather thorough information on a species' distribution. When atlas projects are repeated, usually at 20-year intervals, atlas data can provide rather coarse information on changes in distribution and abundance.

In the past decade, surveys focused specifically on monitoring Common Nighthawk have started across North America, including citizen science surveys coordinated by Wild Research (Knight 2017), aerial insectivore surveys coordinated by Bird Studies Canada, and various surveys coordinated by the provinces and territories (summarized in Environment Canada 2016). These nighttime surveys have clarified the species' breeding range, distribution, and habitat associations, but are still too preliminary to yield information on trends (Center for Conservation Biology 2017).

Abundance

Based on new analytical methods used by Partners in Flight, Common Nighthawk population size in Canada was estimated at 900,000 birds, based on BBS data (Partners in Flight Science Committee 2013). BBS data show higher abundance in British Columbia than elsewhere in the Canadian range (Figure 2).

In contrast, the BAM project estimates that only 270,000 Common Nighthawks breed in Canada, based on an analysis of the amount of suitable habitat available to support 135,000 breeding males (Haché *et al*. 2014). Reasons for the discrepancy between the BBS and BAM estimates are not completely understood, although it does not appear to be attributable to differences in statistical methods (Haché *et al*. 2014). BBS roadside counts might overestimate breeding density for this species (Haché *et al*. 2014). Conversely, roadside counts inadequately sample recently burned areas of the boreal, where Common Nighthawk may be particularly abundant (Van Wilgenburg *et al*. 2015). Neither dataset adequately samples this crepuscular species at the times when it is most active.

Nonetheless, the BAM population estimate is extrapolated from a larger portion of the Canadian range, with better coverage in the boreal region, more off-road sampling, and more sampling at times of day when the species is most detectable. The BAM methodology is likely to be more rigorous, as it incorporates more variables that influence abundance, including relationships with habitat, climate and region (Wilson pers. comm. 2017). As a consequence, the BAM population estimate is considered here to be the more appropriate.

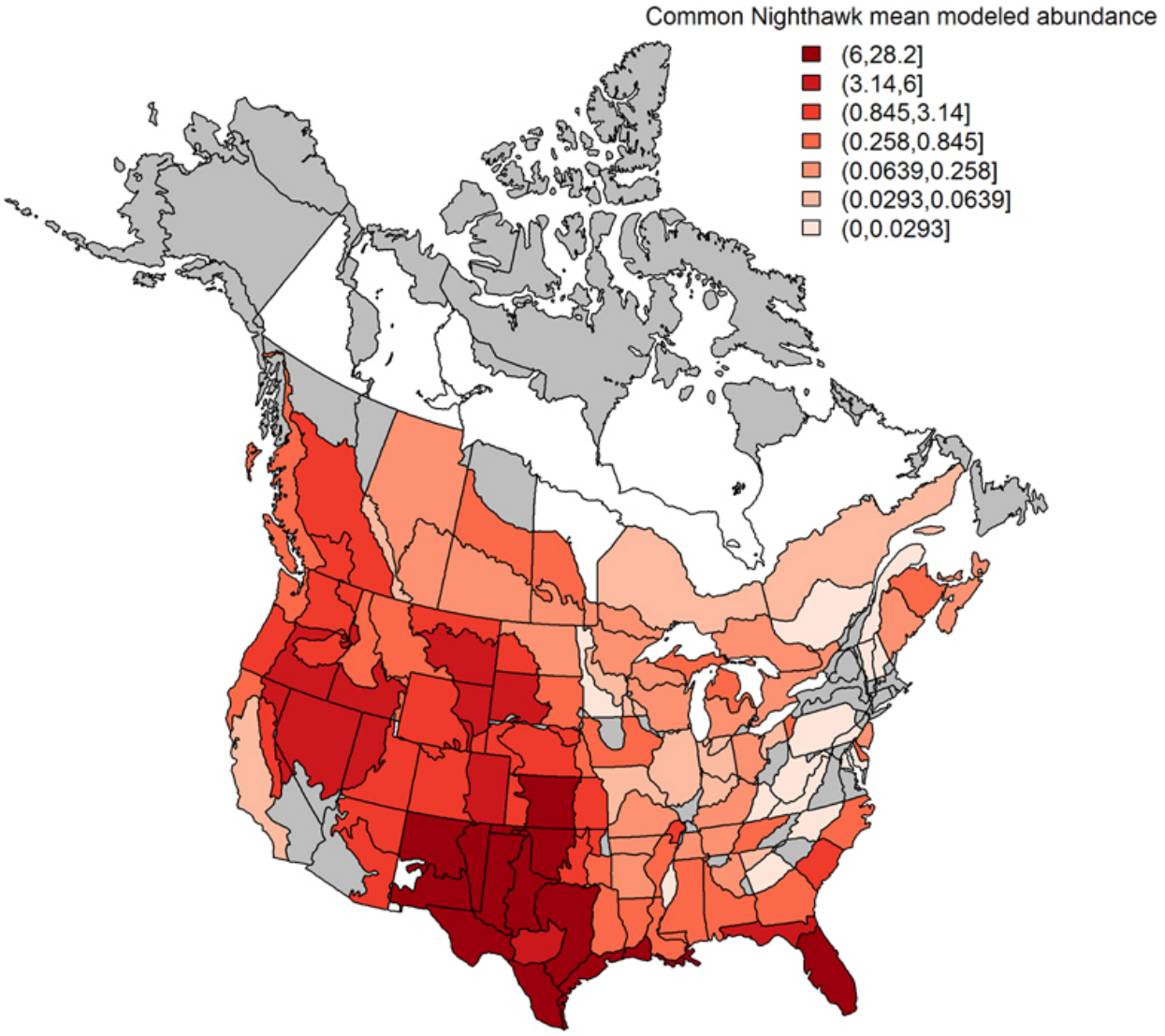

Figure 2. Breeding abundance of Common Nighthawk: Estimated mean annual index across all years included in the long-term trend for all analytical strata used in the calculation of Breeding Bird Survey (BBS) trend estimates ending in 2015 (Environment and Climate Change Canada 2017). North American Breeding Bird Survey - Canadian Trends Website, Data-version 2015. Environment and Climate Change Canada, Gatineau, Quebec, K1A 0H3). Grey areas were not used in the trend estimates. The values of the mean annual index can be interpreted as the estimated average count by an average BBS observer on an average BBS route in each stratum, averaged across all years in the long-term trend.

Fluctuations and Trends

For Canada, the BBS annual index of Common Nighthawk abundance (Figure 3) shows a long-term trend (1970-2015) of -2.48% per year (95% CI: -3.58, 1.46, n=371, Medium reliability), which represents a 68% population decline over that period, especially in that portion of Common Nighthawk range in southern and central Canada covered by the BBS. The short-term 10-year trend (2005-2015) is -1.31% per year (95% CI: -4.03, 1.60, n=307, Medium reliability). This amounts to an estimated 12% decline over that ten-year period. This current estimate is similar to the estimate calculated for recent years until 2009, before which the 10-year trend varied around 30% (see Figure 4). This suggests that the pattern of pronounced long-term decline has been lessening in recent years. Note that these trends are calculated using methods improved since the previous status report (see **Sampling Effort and Methods**, above). However, the discrepancy between the 10-year trend for 1995-2005 in Figure 4, which is -2.67 % per year (95 % CI: -5.50, -0.21) and the 10-year trend for 1995-2005 in COSEWIC (2007), which is -6.6 % per year, is only partly methodological, and the values using the new analysis techniques are considered to be more accurate.

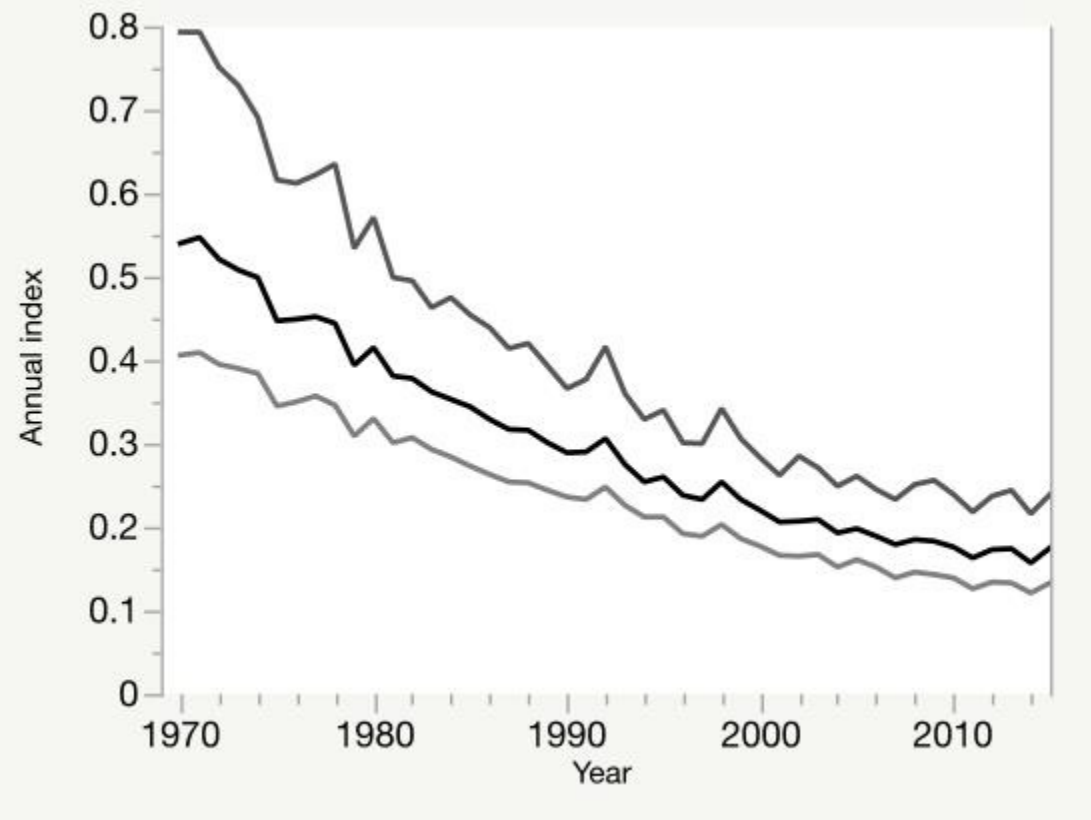

Figure 3. BBS annual index of abundance for Common Nighthawk in Canada over the long term (1970-2015, black line) with 95% credible intervals (grey lines; Environment Canada and Climate Change Canada in preparation, provided by Smith pers. comm. 2017). The annual index provides an indication of the species' abundance as encountered across all BBS routes in Canada, assuming average routes and average observers.

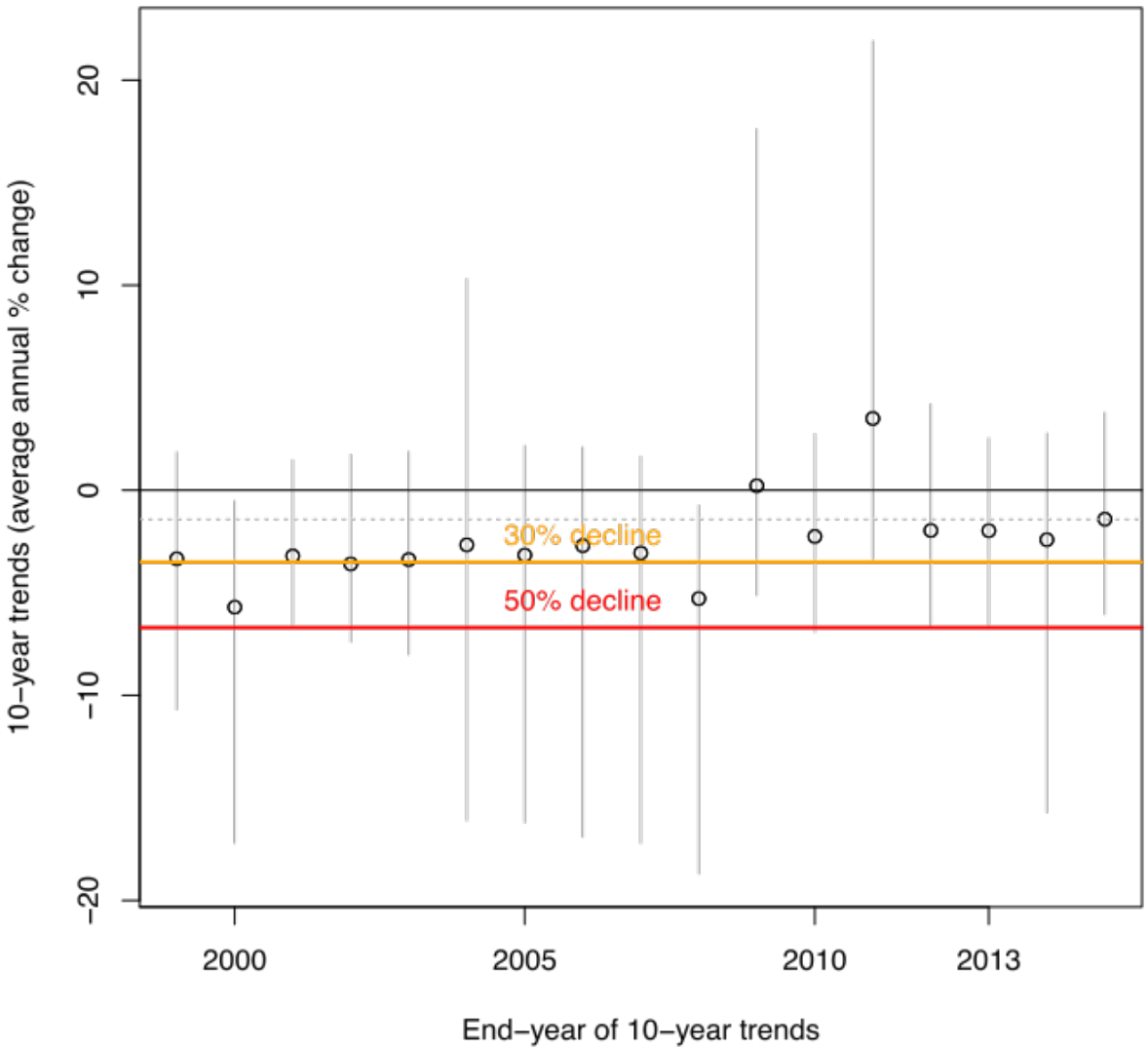

Figure 4. Rolling ten-year trend in BBS annual index of abundance for Common Nighthawk in Canada, calculated for 1999 through 2015, and plotted against the year in which each ten-year period ended (from A. Smith, unpubl. data). Vertical lines show 95% confidence intervals, and horizontal lines show 10-year trend values that indicate a 30% (orange) and 50% (red) overall decline in population. Grey dotted line is the 2015 value, drawn to ease comparison with values from previous years.

For the USA, and North America as a whole, the BBS shows smaller rates of decline in Common Nighthawk numbers than in Canada alone, especially over the short term (Table 1).

Table 1. Breeding Bird Survey trends for Common Nighthawk in Canada, the United States, and North America, in percent change per year, with 95% credible intervals in parentheses and sample size in number of survey routes (N). Long-term trend is for 1970-2015 for Canada, 1966-2015 for the U.S. and North America. All short-term trends are for 2005-2015. Sources: Environment and Climate Change Canada in preparation (Canada; provided by Smith pers. comm. 2016), Sauer *et al.* 2017 (other regions).

Region	Long-term trend	Short-term trend
Canada	-2.48 (-3.58, -1.46), N=371	-1.31 (-4.03, 1.60), N=307
United States	-1.82 (-2.20, -1.48), N=2171	-0.45 (-1.17, 0.31), N=2171
North America	-2.55 (-2.55, -1.59), N=2548	-0.47 (-1.17, 0.27), N=2548

A preliminary analysis by BAM suggested a decline in Common Nighthawk numbers in Canada of 70-80% over the 16-year period from 1997 to 2013 (Haché *et al*. 2014), a period during which the BBS suggested only a 30% decline. The reason for the discrepancy between these trends is unknown, and may reflect poor sampling for this species in either or both datasets (Haché *et al*. 2014). However, there is uncertainty around the BAM results, as the derivation of population trends was not the key objective of that analysis, and these results unlikely to be sufficiently robust to rely on for assessment decisions (Barker pers. comm. 2017). However, they do provide a cautionary indication that the population has undergone a marked decline in the past that may still be continuing though at a lower rate.

Analysis of eBird data suggests a long-term trend (1970-2015) of -3.44% per year (95% CI: -4.35%, -2.53%) for spring and -4.22% per year (95% CI: -5.04, -3.41) for fall (Taylor pers. comm. 2017; Walker pers. comm. 2017; Figure 5), slightly more negative than the -2.48% per year trend reported for BBS, above. The short-term trends (2005-2015) for spring and fall are 2.26% per year (95% CI: -1.42%, 5.94%) and 1.74% per year (95% CI: -2.19%, 5.67%), respectively, with positive values suggesting that the population may have stabilized over that more recent period.

Atlassing projects that have been repeated also show long-term Common Nighthawk declines, although these are over periods longer than 10 years. The Ontario Breeding Bird Atlas estimates an annual rate of change of -2.4% (CI: -3.7 to -1.2), i.e., a 38% decline overall, between 1981-85 and 2001-2005 (Cadman *et al*. 2007). Other atlas projects only report trends qualitatively (i.e., without a numerical estimate). The Alberta atlas reports statistically significant declines in Alberta from 1987-1992 to 2000-2005, without reporting a measure of the magnitude or reliability of the estimate (The Federation of Alberta Naturalists 2007). The Maritimes Breeding Bird Atlas states that the probability of observing the species declined throughout the region from 1986-1990 to 2006-2010, also without a measure of overall magnitude or reliability (Stewart *et al*. 2015).

Data from the second Québec atlas project are not yet available. There was breeding evidence for Common Nighthawk in 18.3% of surveyed squares in 1984-1989 but only 14.8% squares in 2010-2014, with greater coverage in the latter period (2564 squares in 1984-1989, 4033 squares in 2010-2014). Those figures represent a 19% decline in the number of squares with breeding evidence (Robert pers. comm. 2016), but are preliminary and, importantly, do not fully account for search effort.

Regional surveys and historical accounts suggesting declines before the 1990s are reviewed by COSEWIC (2007).

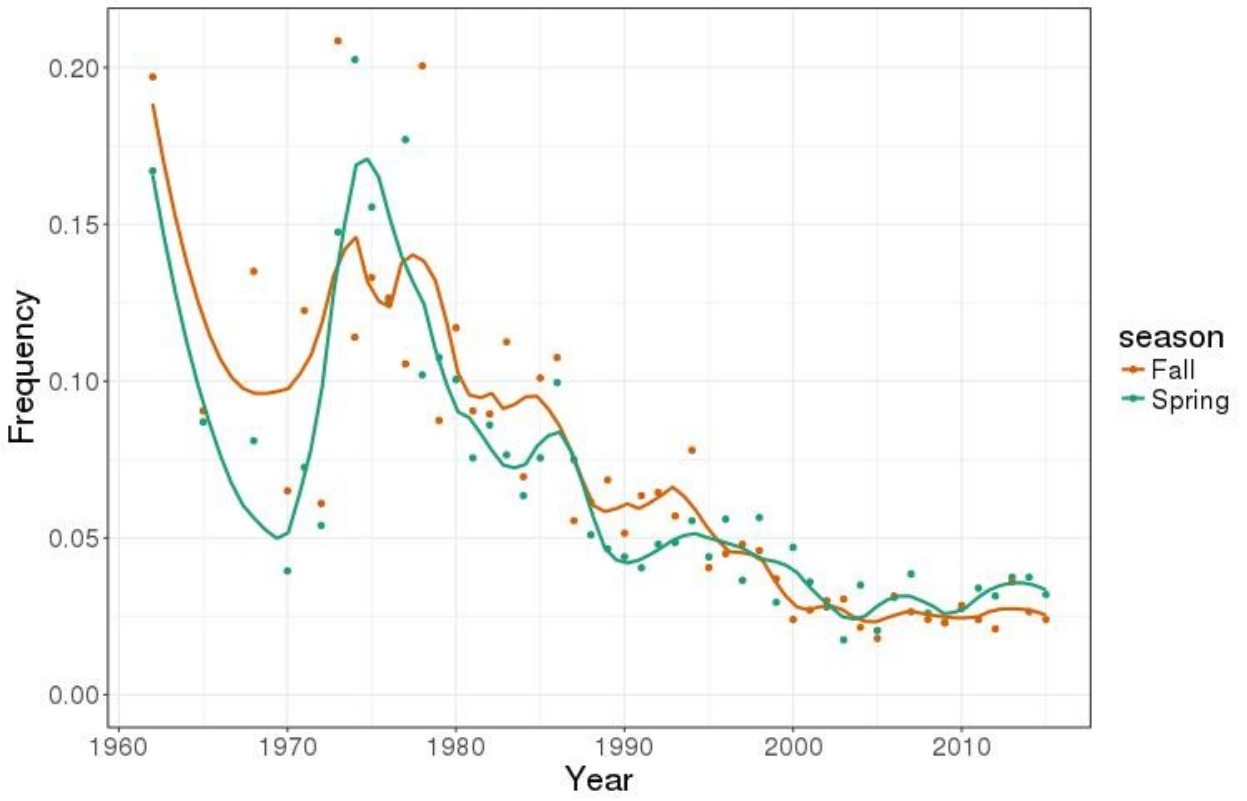

Figure 5. Index of abundance from eBird data for Common Nighthawk in Canada over the long term (1970-2015) in spring (n=274,914 checklists) and fall (n=194,336 checklists), with smoothing lines (locally weighted smoothing with a weight of 2) to visualize year-to-year variation. The index of abundance is roughly equivalent to the probability of the average observer encountering the species when travelling within the species' range, on the date when encountering it is most likely. Only complete checklists, from 40 x 40 km grid areas in which the species appeared on at least 20 checklists, are included. The index statistically accounts for variation in date and search effort, as measured by the number of species on each checklist relative to search protocol (Travelling, Stationary, or Incidental), observer score (based on rates of species accumulation for each observer), and a random effect of site (using the 40 x 40 km grid). Further details in Walker and Taylor (2017); results here and in text provided by J. Walker and P.D. Taylor.

Rescue Effect

A rescue effect through immigration of Common Nighthawks from the much larger, more southern breeding population in the U.S.A. is very unlikely. Common Nighthawk breeds throughout most of the continental United States, including all the states along Canada's southern border, but the population in the U.S.A. is declining overall (Sauer *et al*. 2014). Nighthawk populations in most of the states bordering Canada, those most likely to serve as source populations for rescue, are experiencing declines (Figure 6).

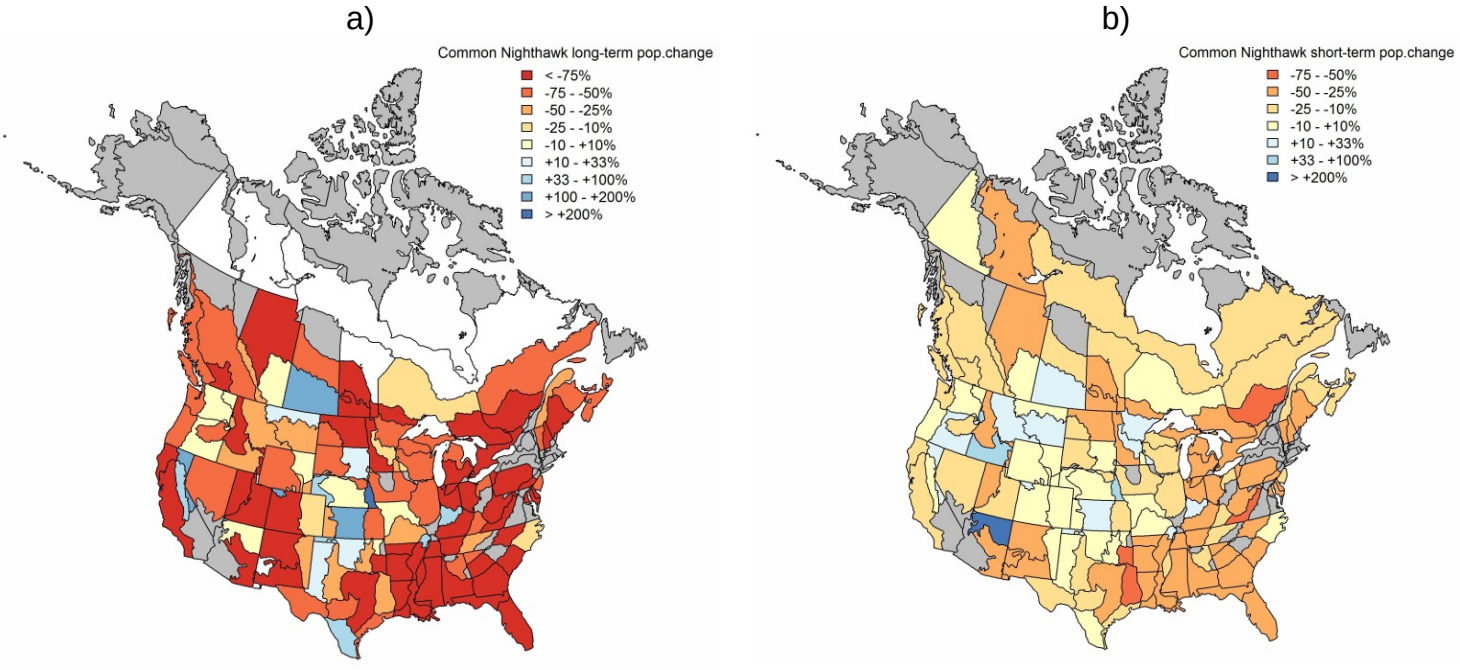

Figure 6. Estimated percent population change of Common Nighthawk, from a) 1970-2015, and b) 2005-2015, for all analytical strata used in the calculation of BBS trend estimates (Environment and Climate Change Canada 2017). The estimated percent population change is a calculation derived from the estimated population trend (mean annual % change) for each stratum.

THREATS AND LIMITING FACTORS

Threats

Threats to Common Nighthawk are generally poorly understood, and may differ across its range. Because the species is an aerial insectivore and most such species are declining, most hypothesized threats relate to the availability of aerial insect food (Nebel *et al*. 2010; Paquette *et al*. 2014; Smith *et al*. 2015; English *et al.* 2017; Stanton *et al*. 2016). One third of monitored insect populations are declining, mainly because of habitat alterations, pesticide use, and climate change (Price *et al*. 2011; Dirzo *et al*. 2014). Other threats to nighthawks are more localized or less severe, although they tend to be better documented than those related to the abundance of aerial insects.

There is considerable regional variation among these threats (Michel *et al*. 2015), even those that affect common requirements for Common Nighthawk. For example, agricultural intensification might lower insect abundance in the wintering range, while increased wildfires might increase it in much of the breeding range (see further discussion below). Several of these threats are well-documented for some aerial insectivores, but evidence for Common Nighthawks is sparse and often anecdotal. It is unknown whether the threats are reversible, although widespread ones are likely not.

The threats to Common Nighthawks reviewed below are categorized following the IUCN-CMP (International Union for the Conservation of Nature – Conservation Measures Partnership) unified threats classification system, based on the standard lexicon for biodiversity conservation of Salafsky *et al*. (2008). The assigned overall threat impact is High-Low (see Appendix 1 for details), primarily due to the impacts of pesticides (in the category of other ecosystem modifications), although the impact of most of the threats noted below was categorized as Unknown or Negligible. The following assessment concentrates on the range in Canada, but considers threats on migration and on the wintering grounds where data exist and where it is known or strongly suspected that migrants or overwintering birds are of Canadian origin. Threats are presented in decreasing order of severity of impact, ending with those for which scope or severity is unknown.

7.3 Other ecosystem modifications (High-low)

Potential changes in insect abundance and community composition due to pesticide use could continue to have an impact on Common Nighthawk, perhaps including Spruce Budworm (*Choristoneura fumiferana*) control in eastern Canada, although pesticide use is declining and evidence of its effects are mixed, as reviewed in Environment Canada (2016). This threat may impact nighthawks breeding in the managed, southern portions of the Canadian range, as well as during migration and on wintering range, as there is evidence that Common Nighthawk spends winters in agricultural landscapes. However, the lack of data has made it difficult to quantify this threat, which may be very significant for this species and other aerial insectivores.

Neonicotinoid pesticides, which have been used increasingly since the 1990s, are known to cause declines in insect populations in the agricultural lands where they are applied, and in associated aquatic environments (Goulson 2014). In turn, these insect declines have been correlated, although not causally linked, to declines in several insectivorous bird species in Europe (Mineau and Palmer 2013; Hallmann *et al*. 2014). The following statements provide further evidence for such causal relationships: those aerial insectivore species that are declining the most pass the winter in countries that spend the most on insecticides (Nocera *et al*. 2014); DDT-induced changes in prey available to Chimney Swifts (*Chaetura pelagica*) corresponded to their population decline (Nocera *et al*. 2012); and use of a biological pesticide in Europe was shown to change the diet and reduce the breeding success of House Martins (*Delichon urbicum*; Poulin *et al*. 2010).

1.1 and 1.2 Residential and commercial development (Negligible threat impact)

In urban residential and commercial environments, which comprise only a small portion of Common Nighthawk range in Canada, changes in roof construction may threaten local populations, by removing nesting conditions appropriate for egg and chick production. Specifically, changes from pea gravel roof surfaces to larger gravel (Wedgwood 1992), un-walled and poorly drained roofs (Sandilands 2010), and use of smooth surfaces such as rubber (Marzilli 1989), have all been associated with local declines of nighthawks (Brigham *et al*. 2011; Coll 2013).

Currently, flat roofing is not being replaced at a high rate (although new construction could be an issue), and commercial roofs are generally flat, although the conversion of pea gravel to larger-grained gravel could have an adverse effect. Also, nighthawks use a variety of habitats, and affected individuals could conceivably relocate to new nesting sites if needed, although this ability may be limited.

2.1 and 2.3 Agricultural (non-timber) crops, livestock farming and ranching (Negligible)

Agricultural intensification, i.e. extraction of higher yields from a given amount of land (Donald *et al*. 2001), continues on both the breeding and wintering ranges of Common Nighthawk (see **Habitat Trends**, above). Overall, it is suspected to be a negligible threat to nighthawks in Canada, but it has been proposed as a threat to other aerial insectivores, mainly through its effect on abundance of flying insects. Declines in flying insects worldwide and locally (e.g., Hallmann *et al.* 2017) have been directly attributed to agricultural intensification, through its reduction of plant diversity and alteration of wetlands (Foster 1991; Benton *et al*. 2002; Price *et al*. 2011; Paquette *et al*. 2014). The latter effect is continuing, especially in prairie Canada (Bartzen *et al*. 2010). A few studies have linked these effects to reduced reproductive output in swallows (e.g., Ambrosini *et al*. 2012; Paquette *et al*. 2013, 2014; Stanton *et al*. 2016), though no studies have yet focused on Common Nighthawk. Recent diet studies suggest that it often forages on insects from terrestrial rather than wetland habitats in boreal areas during breeding (Knight *et al*. *submitted*). However, their large aggregations over wetlands, in other habitats and times of year (Ng 2009; Brigham *et al*. 2011), suggest that loss of wetlands may have an importance that is not yet fully documented.

Agricultural intensification may also reduce roosting and nesting habitat. Loss of edges and conversion of agricultural grasslands to croplands remove needed cover and increase disturbance for most ground-nesting bird species (Jobin *et al*. 1996; Corace *et al*. 2009). There is more direct evidence for this effect of agricultural intensification on nighthawks. In prairie habitats, Common Nighthawk is more abundant in grassland than in cropland (Ng 2009; Newberry and Swanson 2016), and less abundant under grazing that is particularly intensive (Messmer 1990) or that encourages shrubs at the expense of grass (Pidgeon *et al*. 2001). Whether such patterns underlie local population declines or shifts in habitat use is unknown, and some agricultural practices, such as moderate grazing, may actually sustain suitable nesting habitat (Ng 2009). Locally, nighthawk nesting sites have been crushed by livestock or agricultural equipment (Campbell *et al*. 2006), but presumably with negligible effects at the population level.

A regional threat of unknown severity is the reforestation of areas originally cleared for agriculture, following the cessation of farming. Reforestation may be reducing habitat availability for several species that require cleared areas, including Common Nighthawk (Smith 1996; Parody *et al*. 2001), especially in southern Ontario and Québec (Bollinger 1995; Cadman *et al*. 2007). For nighthawks breeding in forested habitats, it is the loss of open areas within the forest, which provide nesting and foraging habitat, that is likely most important for this species, as has been shown for the ecologically similar European Nightjar (*C. europaeus*; Langston *et al*. 2007) and Eastern Whip-poor-will (English *et al.* 2017).

4.1 Transportation and service corridors - roads and railroads (Negligible)

Nightjars often roost along roads, where they risk collision with vehicles (Poulin *et al*. 1998; Brigham *et al*. 2011), especially where roads intersect feeding aggregations (Stevenson and Anderson 1994). Males have been reported as being particularly susceptible to colliding with telephone and power lines during aerial courtship displays (Erikson 2005), and at one U.S. airport, 82% of bird strikes involved this species (Cummings *et al*. 2003). When compared to other landbird species, Common Nighthawk has among the lowest reported collision rates with vehicles, buildings, communication towers, and wind turbines (Bishop and Brogan 2013; Longcore *et al*. 2013; Loss *et al*. 2014a,b; Fense *et al*. *submitted*), although these figures do not account for population size or exposure. Nonetheless, losses from collisions may be offset by gains from the open nesting habitats that these corridors provide (e.g., Campbell *et al*. 2006).

7.2 Dams and water management and use (Negligible)

New dams can dry out wetlands that support populations of flying insects (e.g., Foster 1991) and may flood nests and nesting habitat (Siddle 2010), an effect that may continue after construction as water levels fluctuate during dam operations. The scale and severity of this threat may be negligible overall, but local populations may be severely affected by large projects, such as the planned Site C project that will flood Common Nighthawk habitat along the North Peace River of British Columbia (Siddle 2010).

8.1 Invasive non-native or alien species and diseases (Negligible)

Especially in urban and suburban habitats, medium-sized non-native predators, such as domestic and feral cats, have increased in numbers, potentially increasing the risk of predation, especially on eggs and young.

8.2 Problematic species/diseases (Negligible)

Although Common Nighthawks often avoid natural predators, increases in American Crow (*Corvus brachyrhynchos*) numbers have been related to increased predation on Common Nighthawk in at least one urban study (Latta and Latta 2015), and increases in gulls (*Larus* spp.) to increased competition for urban nest sites in Québec (COSEWIC 2007) and British Columbia (Campbell *et al*. 2006). Increases in crows and gulls in the

Greater Toronto area from the 1970s to 1990s corresponded with a decrease in breeding nighthawks, which was reversed when crows and gulls decreased again in the early 2000s (Coady 2007). Nest predation by such native predators might be more prevalent in southern Canada than in the boreal region. Predation rates in the south are often high for ground-nesting species, although there is little evidence of the importance of this threat for nighthawks *per se*.

9.6 Excess energy (light pollution) (Negligible)

Many flying insects rely on light cues for navigation and developmental phases; for example, the emergence of aquatic insects can be disrupted by artificial lighting. There is growing evidence that these effects can reduce insect populations (e.g. Bruce-White and Shadlow 2011; Gaston *et al*. 2013; Langevelde *et al.* 2017). Conversely, at a local level, insects attracted to artificial lights provide a concentrated food source that Common Nighthawk frequently exploits (Brigham *et al*. 2011). Whether this attraction yields a net benefit has not been examined for nighthawks, but has been for bats, in which any benefit of increased food appears to be outweighed by disruption of daily routines and increased risk of predation (e.g., Rydell *et al*. 1996).

7.1 Fire and fire suppression (Unknown)

The overall impact of fire suppression on Common Nighthawk populations is unknown (Environment Canada 2016). In both forest and grassland habitats, fires may destroy nests locally, a particular hazard for a species with a short breeding season but a long incubation and nestling period, in comparison to other landbirds. Conversely, wildfires create un-vegetated areas that are often selected for nesting (Weeber *et al.* unpublished ms), and can cause insect outbreaks (Perera and Buse 2014), whereas fire suppression may allow bare ground to become vegetated and unsuitable for nesting (Environment Canada 2016). Uncontrolled wildfires are likely increasing in frequency throughout most of the boreal forest (Natural Resources Canada; Wang *et al*. 2017), which constitutes most of this species' Canadian range.

9.3 Agricultural and forestry effluents (Unknown)

Direct evidence that agricultural, forestry, and other (e.g., mosquito control) pesticides affect Common Nighthawk is lacking, but individuals that breed in Canada likely migrate through and winter in agricultural areas where such pesticides are used. Lethal organochlorides, such as DDT, are banned in North America, but are still present in insectivorous migrant birds as they return there to breed after wintering in Central and South America, where such chemicals continue to be used (Klemens *et al*. 2000). Less lethal carbamates and organophosphates, as well as neonicotinoids, while tightly regulated in North America, are in widespread use throughout the range of Common Nighthawks (FAO 2015). The severity of their direct effects on insectivorous birds may be underestimated (Mineau and Palmer 2013; Mineau and Whiteside 2013; Gibbons *et al*. 2015).

9.5 Air-borne pollutants (Unknown)

Two airborne pollutants that prevail in some boreal habitats present potential threats to Common Nighthawk: mercury, which can have a variety of sub-lethal effects in birds, including reduced reproductive success, and acid rain, which might exacerbate the effects of mercury, and reduce the availability of aquatic insects that provide calcium needed by birds (Environment Canada 2016). Evidence for negative effects on boreal bird populations is mixed, however (reviewed in Environment Canada 2016).

11 Climate change and extreme weather (Unknown)

Climate change is evident throughout the species' range, although its effects on population levels are uncertain. Models predict an increase in the incidence of fires and gradual expansion of boreal habitats into lowlands north of the boreal forest, likely with a net positive benefit for the species. Nonetheless, changes in temperature regimes and temperature extremes may be detrimental. For aerial insectivores in general, climate warming may be reducing the availability of insect prey overall (English *et al.* 2018, Tseng *et al.* 2018). In particular, it may result in phenological mis-match between peaks of insect abundance and the times of year when these birds most need food resources, such as at egg laying, moult, and, especially, chick-rearing. The risk of such asynchrony may be particularly severe for long-distance migrants, such as Common Nighthawk, because temperature shifts are more dramatic at higher latitudes and because cues that trigger migration from wintering grounds poorly predict conditions on distant breeding grounds (Both *et al*. 2010). There is widespread evidence for shifts in the timing of both insect and bird breeding, and some evidence linking such mis-matches to reduced reproductive success or population declines (e.g., Jones and Cresswell 2010; Saino *et al*. 2010). On balance, however, the evidence for a causal link between the two is equivocal for terrestrial birds (Dunn and Møller 2014; Mayor *et al*. 2017), although well-established for birds in other systems (e.g., Hipfner 2008).

Climate change also continues to increase the frequency and severity of temperature variation worldwide (Huber and Gulledge 2011). Hot weather can overheat nighthawk chicks, whereas cold snaps challenge the species' tight energy budget (see **Physiology and Adaptability,** above) and reduce the availability of flying insects (Brigham *et al*. 2011). These effects are worse when combined with precipitation impacts. Extremes of precipitation affect the abundance of flying insects, and have occurred more frequently in recent years across wide portions of the range of Common Nighthawk (Haile 2000; Boulton and Lake 2008). High precipitation, especially when accompanied by cold temperatures, is well-known to increase mortality and decrease reproductive success in aerial insectivores (Brown and Brown 2000; García-Pérez *et al*. 2014). There are no studies documenting its population-level effects on Common Nighthawk *per se*, but effects of precipitation can be locally severe. For example, high precipitation in British Columbia in 1990 apparently caused starvation and nest failure in Common Nighthawk (Firman *et al*. 1993), and cold, rainy weather coincided with a mass nighthawk die-off in Massachusetts in 1905 (Griscom 1949).

Finally, intense storms might present localized threats to aerial insectivores, which only forage on the wing and often at frontal edges (confluences of cold and warm air masses) where flying insects are concentrated (Russell 1999; Russell and Wilson 1997; Taylor 2009). One tropical storm, Hurricane Wilma, killed so many Chimney Swifts that it caused a detectable population decline, presumably by forcing them into continuous flight while not allowing efficient foraging (Dionne *et al*. 2008). The intensity of tropical storms in the North Atlantic has been increasing since the 1980s (Bender *et al*. 2010; Kossin *et al*. 2010; Kishtawal *et al*. 2012), while population declines across aerial insectivores also intensified (Nebel *et al*. 2010; Smith *et al*. 2015). Being a long-distance migrant may increase the vulnerability of Common Nighthawk to this threat.

Limiting Factors

The species' tight energy budget and reliance on insects caught in flight (see **Physiology and Adaptability,** above) increase its vulnerability to threats, especially those related to weather and insect abundance. Common Nighthawk's long annual migration between North and South America and brief breeding season restrict the species to one clutch of two eggs per season; this low reproductive rate may slow its recovery from population decreases.

Number of Locations

Common Nighthawk has such a broad distribution and faces so many potential threats that its number of locations (i.e., distinct areas vulnerable to particular threats) cannot be calculated, but is certainly much greater than ten.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

Common Nighthawk is protected under the *Migratory Birds Convention Act*, 1994, which protects the birds, their nests, and eggs from harm and disturbance anywhere it is found in Canada. It has been listed as Threatened under Schedule 1 of the *Species at Risk Act* since 2007. That listing led to development of a Recovery Strategy, which includes plans to address several threats, close knowledge gaps, and identify critical habitat (Environment Canada 2016). In Canadian National Parks where the species occurs (including at least 20 in which it breeds), the birds, their nests, and their habitats are protected under the *National Parks Act*. Provincially, the species is listed as likely to be designated as threatened or vulnerable in Québec (on the *Liste des espèces susceptibles d'être désignées menacées ou vulnérables*), as Special Concern in Ontario, and as Threatened in Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, and Yukon.

Non-Legal Status and Ranks

BirdLife International and NatureServe (2016) consider Common Nighthawk to be Least Concern globally, and in the United States, the species is not considered endangered and is not listed as a “Bird of Conservation Concern” (USFWS 2008). Partners in Flight, however, lists it among the Common Birds in Steep Decline, which are species estimated to have lost at least 50% of their population since 1970 (Rosenberg *et al*. 2016). NatureServe (2016) ranks Common Nighthawk as G5 (Globally Secure), and it is considered Apparently Secure (N4B) in Canada and Secure (N5B) in the United States. Subnational ranks in Canada and the United States are listed in Table 2.

Table 2. NatureServe Status Ranks for Common Nighthawk in Canada and the United States (from NatureServe 2016; Bennett pers. comm. 2017; Humber pers. comm. 2017). NatureServe does not provide a rank for Nunavut. States with no rank or a rank of S4 (Apparently Secure) or greater not shown.

Subnational ranks for Canadian provinces	
Alberta	S4
British Columbia	S4B
Labrador	S2B
Manitoba	S3B
New Brunswick	S3B
Newfoundland and Labrador	SNA (Newfoundland)S2B, SUM
Northwest Territories	S2B
Nunavut	-
Nova Scotia	S3B
Ontario	S4B
Prince Edward Island	S1B
Québec	S3
Saskatchewan	S4S5B,S4S5M
Yukon Territory	S3B
Subnational ranks of S4 or less in United States*	
Arkansas	S3B,S4N
Connecticut	S1B
Delaware	S2B
Maryland	S3S4B

Massachusetts	S2B,S5M
New Hampshire	S1B
New Jersey	S3B,S3N
New York	S2S3B
North Carolina	S3B
Pennsylvania	S3S4B
Rhode Island	S1B
Vermont	S1B
West Virginia	S3B
Wisconsin	S2S3B

* N (at start of rank) National, S Subnational, B Breeding, N (at end of rank) Nonbreeding, 1 Critically Imperiled, 2 Imperiled, 3 Vulnerable, 4 Apparently Secure, 5 Secure, X Extirpated, NR Not Ranked, U Unrankable (due to lack of information or conflicting information).

Habitat Protection and Ownership

Common Nighthawk occupies a large geographic range that includes protected and unprotected, private and government-owned lands. Given this broad range and the uncertainty over the bird's habitat needs, it is difficult to estimate what proportion of its habitat in Canada is protected, apart from stating that less than 12% of land is protected throughout most of the species' range (Environment and Climate Change Canada 2016).

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

The authorities listed below provided invaluable data and/or advice. Thanks also to the thousands of volunteers who participated in or served as coordinators for the Breeding Bird Survey and Canadian breeding bird atlases over the years.

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Andrew Gregg Horn earned his B.Sc. in Biological Sciences at Cornell University and his Ph.D. in Zoology at University of Toronto. Now he is a Research Adjunct at Dalhousie University, researching avian acoustic communication and teaching courses in animal behaviour. He also undertakes various projects in avian monitoring and assessment, and has helped draft several status and recovery documents, including the federal recovery strategy for Common Nighthawk (Environment Canada 2016).

COLLECTIONS EXAMINED

No collections were examined in the preparation of this report.

Appendix 1. Threats Calculation Table for Common Nighthawk.

THREATS ASSESSMENT WORKSHEET

Species or Ecosystem Scientific Name	Common Nighthawk (*Chordeiles minor*)
Element ID	**Elcode**
Date (Ctrl + ";" for today's date):	14/02/2017
Assessor(s):	Dwayne Lepitzki, Andy Horn, Richard Elliot, Marcel Gahbauer, Mary Sabine, Jessica Humber, Shelley Garland, Dave Fraser, Robin Gutsell, Louise Blight, Elsie Krebs, Pam Sinclair, Liana Zanette, Elly Knight, Mark Brigham, Emily Rondel, Megan Harrison, Bruno Drolet, Karolyne Pickette, Rich Russell, Kevin Hannah, Greg Mitchell, Kim Borg, Peter Thomas, Stephen Davis, Nathan Hentze, Mike Burrell, Joanna James
References:	Draft threats calculator prepared by Andy Horn (7 February 2017), and draft Common Nighthawk Status Report.

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	0	0
D	Low	0	1
	Calculated Overall Threat Impact:	High	Low

Assigned Overall Threat Impact:	**BD = High - Low**
Impact Adjustment Reasons:	
Overall Threat Comments	There is sufficient genetic and morphological consistency across the three subspecies to consider Common Nighthawk as one Designatable Unit. Generation time is taken as 2-3 years, so a 10-year timeframe is appropriate to assess severity and timing of threats, as it exceeds 3 generations. The species breeds throughout southern and central Canada, and winters in South America. This assessment concentrates on the Canadian range, but considers threats on migration and on the wintering grounds where data exist and where it is known or suspected that migrants or overwintering birds are of Canadian origin. There may be confusion with southern nighthawk species when outside North America. There was an estimated 12% population decline from 2005-2015. As more than 50% of the Canadian range is in northern boreal forest, scientific information may be biased towards the southern portion of the range, as there is less information for boreal Canada.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1	Residential & commercial development		Negligible	Negligible (<1%)	Moderate - Slight (1-30%)	High (Continuing)	
1.1	Housing & urban areas		Negligible	Negligible (<1%)	Moderate - Slight (1-30%)	High (Continuing)	Changing roof construction practices may reduce availability of nesting sites, as flat roofing is not being replaced at a high rate, and new construction may be an issue. However, nighthawks use a variety of habitats, and displaced individuals could relocate to new nesting sites, although this ability may be limited. Most individuals are not exposed to this threat, as most nest in rural areas or forests.
1.2	Commercial & industrial areas		Negligible	Negligible (<1%)	Moderate - Slight (1-30%)	High (Continuing)	Same threats scores apply as for 1.1, for similar reasons. Suitable commercial roofs for nesting are generally flat, although the trend towards conversion from pea gravel to larger-grained gravel in roof construction could reduce their suitability as nest-sites.
1.3	Tourism & recreation areas		Negligible	Negligible (<1%)	Slight (1-10%)	High (Continuing)	There is evidence that nighthawks use recreational areas such as campgrounds or golf courses when these create openings in the forest.
2	Agriculture & aquaculture		Negligible	Negligible (<1%)	Slight (1-10%)	High (Continuing)	
2.1	Annual & perennial non-timber crops		Negligible	Negligible (<1%)	Slight (1-10%)	High (Continuing)	Scope is negligible, as it is unlikely that much additional land will be converted to agriculture (except perhaps in some northern areas, e.g., near Prince George, BC), although existing agricultural land may be farmed more intensively (e.g., through conversion of hay and fallow to cash crops). The number of farms in Canada is declining, and those remaining are becoming larger and more intensively farmed. There is a continuing decline of native prairie, although impacts on nighthawks are likely negligible. This species has been found nesting in some grass and crop areas.
2.2	Wood & pulp plantations						
2.3	Livestock farming & ranching		Negligible	Negligible (<1%)	Unknown	High (Continuing)	Livestock farming and ranching may be both a threat and potential benefit to this species. Nests are at risk from trampling by cattle, most commonly in areas with dairy cattle. Trampling is unlikely to be an issue in the prairies, where livestock grazing is seen as a net benefit in maintaining short vegetation that can be used been nesting or roosting nighthawks.
2.4	Marine & freshwater aquaculture						
3	Energy production & mining						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
3.1	Oil & gas drilling						In general, activities of the oil and gas industry are not considered a threat. There may be some localized negative disturbance effects, but nighthawks also use land cleared for survey lines and well-pads as nesting habitat, resulting in a net benefit.
3.2	Mining & quarrying						In general, mining and quarrying pose little threat to this species. Nighthawks will nest in or near old coal mines, and new mines or quarries could be of benefit by providing new cleared habitat. Noise from operating mines may put stress individuals nesting nearby, but this is unlikely to be unlikely to be a population-level concern.
3.3	Renewable energy						Studies show that wind turbines are not generally a threat to this species.
4	Transportation & service corridors		Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	
4.1	Roads & railroads		Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	Almost all individuals of this species are exposed to roads at some point in their lives, as they are attracted to roads for warmth when roosting and for insect prey. Roads thus provide benefits in terms of food availability, roosts and associated cleared habitat. New gravel roads in the boreal forest may provide a particular benefit, although nighthawks (especially males) are susceptible to collisions with vehicles on gravel roads, though less so on paved roads.
4.2	Utility & service lines						Installation and maintenance of power lines provides clearings which serve as nesting habitat for this species. There is no evidence that nighthawks collide with structures such as power lines or communication towers.
4.3	Shipping lanes						
4.4	Flight paths						There is one documented incident of collision with aircraft at McConnell air force base in Kansas, U.S.A., but this seems to be an unusual exception.
5	Biological resource use						
5.1	Hunting & collecting terrestrial animals						
5.2	Gathering terrestrial plants						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
5.3	Logging & wood harvesting						Logging is likely beneficial to this species in most cases, as it often maintains heterogeneity in the landscape, creating small-scale clear-cuts which provide openings for nesting and foraging habitat. Logging may affect the availability of aerial insects on which to forage, although this effect may sometimes be positive, and nighthawks are quite adept at locating food. As this species tends to nest late into mid-summer, it may be affected by summer timber harvesting.
5.4	Fishing & harvesting aquatic resources						
6	Human intrusions & disturbance						
6.1	Recreational activities						
6.2	War, civil unrest & military exercises						
6.3	Work & other activities						Scientific research on this species will continue over the next 10 years, but is low in impact and will not have a measurable effect.
7	Natural system modifications	BD	High - Low	Pervasive (71-100%)	Serious - Slight (1-70%)	High (Continuing)	
7.1	Fire & fire suppression		Unknown	Restricted - Small (1-30%)	Unknown	High (Continuing)	Fire poses a threat to nests and perhaps individual birds, although fire suppression reduces habitat for the species and is considered to be a more important threat overall. Fire suppression is less frequent and of lower concern in northern boreal areas, as fires are more likely to be human-caused and actively suppressed in southern Canada.
7.2	Dams & water management/use		Negligible	Negligible (<1%)	Negligible (<1%)	High (Continuing)	The construction of new dams dries out lowland habitat downstream (e.g., Bennett dam), which may impact insect populations. The fluctuation of water levels caused by operation of existing dams may flood nests, in a ongoing impact.
7.3	Other ecosystem modifications	BD	High - Low	Pervasive (71-100%)	Serious - Slight (1-70%)	High (Continuing)	Changes in insect abundance and community composition due to pesticide use (including increasing Spruce Budworm control in eastern Canada) could continue to have an impact on this species. This threat may impact nighthawks in southern Canada and the southern part of boreal regions, as well as during migration and on wintering range, as there is evidence that this species spends winters in agricultural landscapes. However, the lack of data has made it difficult to quantify this threat.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
8	Invasive & other problematic species & genes		Negligible	Negligible (<1%)	Moderate (11-30%)	High (Continuing)	
8.1	Invasive non-native/alien species/diseases		Negligible	Negligible (<1%)	Moderate - Slight (1-30%)	High (Continuing)	This ground-nesting species is likely exposed to predation by cats (including feral cats) and the Norway Rat (*Rattus norvegicus*), especially in urban and rural areas in southern Canada, although studies suggest that nest success rates there are still quite high (90%), and nests located on roofs are less accessible to these non-native predators.
8.2	Problematic native species/diseases		Negligible	Negligible (<1%)	Moderate - Slight (1-30%)	High (Continuing)	Nest predation by native predators (e.g., by Raccoon, American Crow, Grey Jay (*Perisoreus canadensis*)) appears to be more prevalent in southern Canada than in the boreal region. There is little evidence to support the negative effects of this threat on nighthawks, although predation rates are often quite high for other ground-nesting species.
8.3	Introduced genetic material						
8.4	Problematic species/diseases of unknown origin						
8.5	Viral/prion-induced diseases						
8.6	Diseases of unknown cause						
9	Pollution		Unknown	Large (31-70%)	Unknown	High (Continuing)	
9.1	Domestic & urban waste water						
9.2	Industrial & military effluents						
9.3	Agricultural & forestry effluents		Unknown	Large - Small (1-70%)	Unknown	High (Continuing)	It is possible that some nighthawks consume pesticides or insects with high pesticide loads, especially in the U.S.A. and Mexico,. However, there is no evidence that this is an issue, and little information on how this species would be affected.
9.4	Garbage & solid waste						
9.5	Air-borne pollutants		Unknown	Large (31-70%)	Unknown	High (Continuing)	Mercury and acid rain may affect the boreal forest population with unknown severity, primarily by affecting food availability. However, there is no evaluation of effects of these contaminants on this species, which may occur if this species consumes insects that emerge from contaminated wetlands.
9.6	Excess energy		Negligible	Negligible (<1%)	Unknown	High (Continuing)	Light pollution may concentrate insect prey in urban areas, resulting in a net benefit for this species, although it may also expose them to slightly higher levels of predation.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
10	Geological events						
10.1	Volcanoes						
10.2	Earthquakes/tsunamis						
10.3	Avalanches/landslides						
11	Climate change & severe weather		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	All subcategories for Threat category 11 apply to this species. There is evidence of climate change throughout its range, although net overall effects on population levels are uncertain.
11.1	Habitat shifting & alteration						Models predict an increase in the incidence of fires and gradual expansion of habitats into lowlands north of boreal forest, with a likely net positive benefit for the species
11.2	Droughts						
11.3	Temperature extremes						
11.4	Storms & flooding						
11.5	Other impacts						
Classification of Threats adopted from IUCN-CMP, Salafsky *et al*. (2008).							