

# WildResearch Nightjar Survey 2017 Annual Report

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Report prepared by  
Elly Knight, Program Manager  
Alex Noble-Dalton, New Brunswick Regional Coordinator

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The WildResearch Nightjar Survey is a program under non-profit organization,  
WildResearch.

WildResearch's mission is to build, train, and educate a community that contributes to  
conservation science.



In-kind support for the WildResearch Nightjar Survey in 2017 was provided by Bird  
Studies Canada, the Community Mapping Network, and many other naturalist  
organizations across Canada.



**Community Mapping Network**

*The WildResearch Nightjar Survey is made possible by the dedicated Citizen Scientists who generously donate their time to survey for and report on these cryptic birds.*

*Thank you to all WildResearch Nightjar Survey volunteers!*

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## Executive Summary

The WildResearch Nightjar Survey is a volunteer-run citizen science program that conducts nocturnal roadside surveys for three highly understudied species of conservation concern: the Common Nighthawk, the Common Poorwill, and the Eastern Whip-poor-will. All three species belong to the nightjar family, which is a group of cryptic migratory birds that forage for flying insects at night. All three species are understudied because their nocturnal habits preclude their detection during other survey programs like the Breeding Bird Survey. The data available for nightjars indicate that their populations are in decline. The Common Nighthawk and Eastern Whip-poor-will are both listed as Threatened under Canada's *Species at Risk Act* due to these perceived declines. The Common Poorwill has been assessed as Data Deficient by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) because sufficient surveys have not been completed. Citizen science surveys are an ideal way to study nightjars and contribute to their conservation because they can efficiently collect reliable data over a large geographic extent.

The goal of the WildResearch Nightjar Survey in 2017 was to continue to survey within the regions that we expanded to in 2016. In 2017, 198 citizen scientists surveyed and submitted data for 1,681 survey stations along 146 routes. Volunteers reported observations of 858 Common Nighthawks, 32 Common Poorwills and 2 Eastern Whip-poor-wills in 2017. Survey effort decreased slightly from 2016, likely as a result of seeking funds to hire a research intern to conduct surveys and help with volunteer recruitment. Citizen science volunteers continued to survey using the new standardized Canadian Nightjar Survey Protocol, which we will be translated to French for the 2018 survey season. Almost 80% of volunteers submitted their survey data through the improved WildResearch Nightjar Atlas data entry portal, which is a substantial increase from 44% in 2016.

In 2017, we also continued our commitment to education and research by hosting several public science talks and volunteers orientation sessions prior to the survey season. We continue to work with undergraduate students to revise their research projects using WildResearch data for scientific publication. Acoustic data from the WildResearch Nightjar Survey were used in our first scientific publication about automatic detection of Common Nighthawk vocalizations. Finally, we are pleased to announce that the entire database has been shared for Common Nighthawk recovery planning purposes.

Looking forward, we will continue our expansion in 2018 by launching a new chapter in Ontario, and expanding surveys in the Maritimes with the addition of routes in Nova Scotia. We are also exploring the long-term viability of the program and its contribution to population monitoring. We plan to compare WildResearch Nightjar Survey data to Breeding Bird Survey data to determine whether the program increases our ability to detect changes in nightjar populations.

## 1. BACKGROUND

### 1.1. Family Caprimulgidae: Nightjars

Nightjars are a family of cryptic birds that forage for flying insects at night. Due to their feeding habits, nightjars belong to a larger guild of birds called the aerial insectivores. Many of these species are highly migratory, spending their winters as far south as Argentina. These beautiful birds have long pointed wings for flight, and are highly camouflaged because they roost during the day and nest on the ground. There are three species of nightjars that regularly occur in Canada: Common Nighthawk (*Chordeiles minor*), Common Poorwill (*Phalaenoptilus nuttallii*), and Eastern Whip-poor-will (*Antrostomus vociferus*).



*A Common Nighthawk roosts on a rocky bluff. Photo: Dwayne Gaschermann*

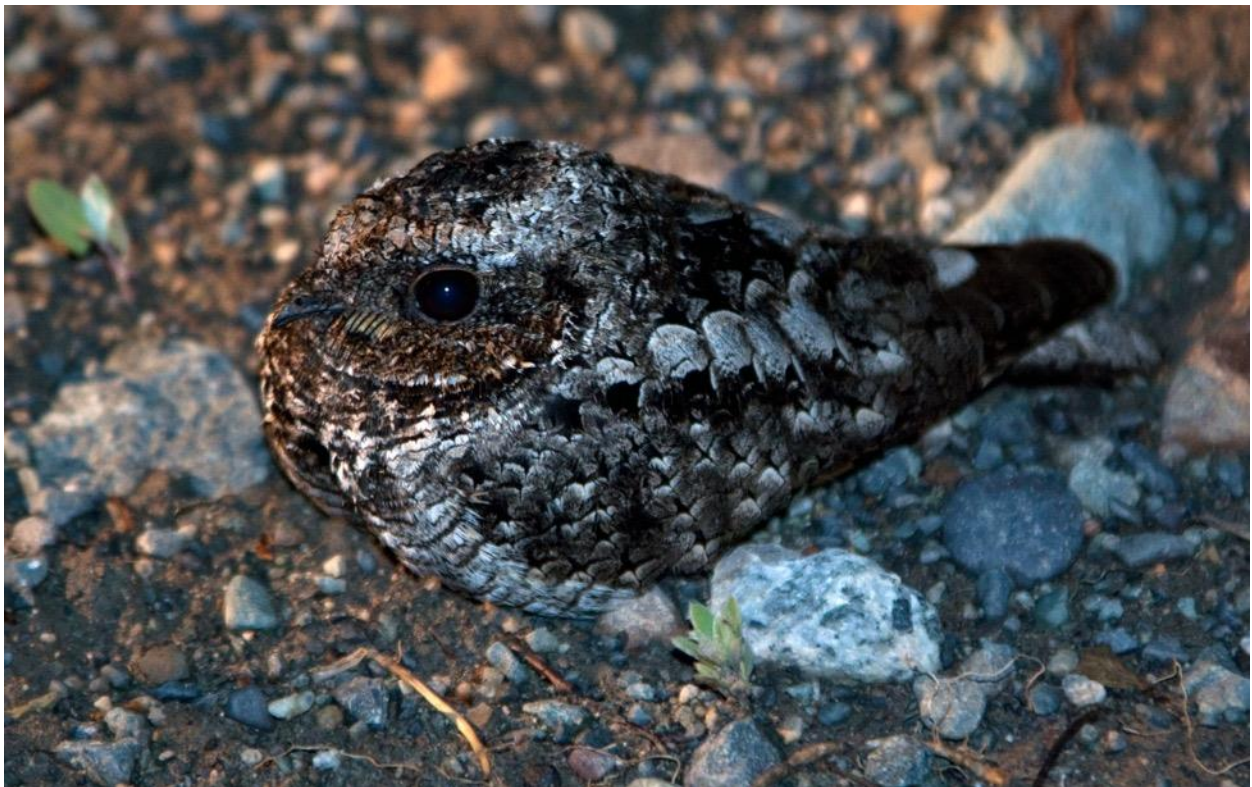
### 1.2. Why Survey Nightjars?

Relatively little is known about the population trends of nightjars due to their nocturnal habits and cryptic nature; however, steep population declines of other aerial insectivore species have been detected across North America. Although nightjar species are often missed by other bird survey programs, Breeding Bird Survey data indicate that many nightjar populations in Canada are also in decline. The Common Nighthawk and Eastern Whip-poor-will are federally listed as Threatened under Canada's *Species at Risk Act* due to these perceived declines. The Common Poorwill has been assessed as Data Deficient by COSEWIC because sufficient surveys have not been completed.



### 1.3. How to Survey Nightjars?

Nocturnal roadside citizen science surveys are an ideal method to study nightjars in Canada and contribute to conservation. The nocturnal nature of these birds requires that survey stations must be easily accessible for surveyor safety. Travelling by car allows surveyors to travel quickly between stations that are far enough apart to ensure that birds are not counted twice. Citizen science surveyors allow for survey coverage of large geographic areas, which is important because nightjars are found across Canada. Data collected by citizen scientists during nocturnal roadside surveys will allow for analyses of habitat associations, long-term population monitoring, distribution and abundance mapping, and environmental assessment of these cryptic birds. Lastly, citizen scientists contribute invaluable local knowledge to the project including incidental nightjar reports and information about route accessibility and local habitat.



*A Common Poorwill roosts at night. Photo: Alan Burger*

### 1.4. Program Objectives

The goal of the WildResearch Nightjar survey is to contribute to the conservation and recovery of nightjars in Canada. To achieve this goal, the program has several multi-species objectives and one single-species objective per species.

#### 1.4.1. Multi-species Objectives

- Collect baseline inventory data on nightjar populations in Canada.
- Determine best survey methods for nightjars in Canada and compare to other existing monitoring programs.

- Raise awareness on nightjar conservation and biology in Canada.

#### 1.4.2. Single-species Objectives

- **Common Nighthawk:** investigate habitat associations in Canada.
- **Common Poorwill:** determine the extent of the species range in British Columbia, Alberta, and Saskatchewan.
- **Eastern Whip-poor-will:** survey the historic range in Saskatchewan to confirm a range contraction.

### 1.5. Program Background

The WildResearch Nightjar Survey began in south central British Columbia in 2010 and expanded to the rest of the province in 2014. The first four years of the program were conducted in the Okanagan region to target an area where Common Nighthawk and Common Poorwill are abundant. Surveys collected from 2010 to 2013 followed a standardized survey protocol designed by the Nightjar Survey Network in the United States. In 2014, the program was expanded to survey for the Common Nighthawk across their range in British Columbia. Also in 2014, the BC Nightjar Survey protocol was revised to create separate protocols reflecting the two species varying ranges and life histories. Surveys across British Columbia continued in 2015, with several trial surveys also conducted in Alberta and Saskatchewan. There was a major expansion of the WildResearch Nightjar Survey in 2016 as the survey officially launched in 5 new regions: Alberta, Saskatchewan, New Brunswick, the Yukon, and the Northwest Territories. The expansion was made possible by two major accomplishments. First, the Nightjar Atlas was introduced, hosted by the Community Mapping Network, and allowed for automated route sign-up to ease the workload of volunteer coordination. Second, a new standardized Canada Nightjar Survey Protocol ensured that all citizen science nightjar surveyors across the country would follow the same survey methods.

## 2. WILDRESEARCH NIGHTJAR SURVEY METHODS

### 2.1. Survey Protocol

Roadside surveys, beginning at dusk, are used to survey Canada's three nightjar species. Each survey route is a series of 12 survey stations along a public road, which are spaced at least 1.6 km apart. At each survey station, a six-minute passive point count is conducted with an unlimited radius. In other words, the citizen scientist listens quietly for six minutes and records each nightjar detected. Information on wind speed, cloud cover, cars passing, and moon visibility is also collected at each survey station. Each route is sampled once a year between June 15 and July 15. In areas where Common Poorwills or Eastern Whip-poor-wills occur, volunteers are encouraged to survey within one week of the full moon when these birds call most frequently. Surveys start at 30 minutes before sunset and require approximately 2 hours to complete.

For further details, please visit the WildResearch website for copies of the Canadian Nightjar Survey Protocol: <http://wildresearch.ca/resources/nightjar-survey/>



## 2.2. Survey Locations

Per the Canadian Nightjar Survey Protocol, the WildResearch Nightjar Survey uses Breeding Bird Survey (BBS) routes because these routes are randomly selected and will allow us to compare the Canadian Nightjar Survey Protocol to the BBS for long-term trend monitoring. The WildResearch Nightjar Survey also incorporates survey routes from other previous nightjar surveys, randomly selected routes in British Columbia that were selected earlier in the program's history, some subjectively placed routes based on the occurrence of nightjars, and some routes in locations where Eastern Whip-poor-will have been historically detected.

## 3. SUMMARY OF 2017

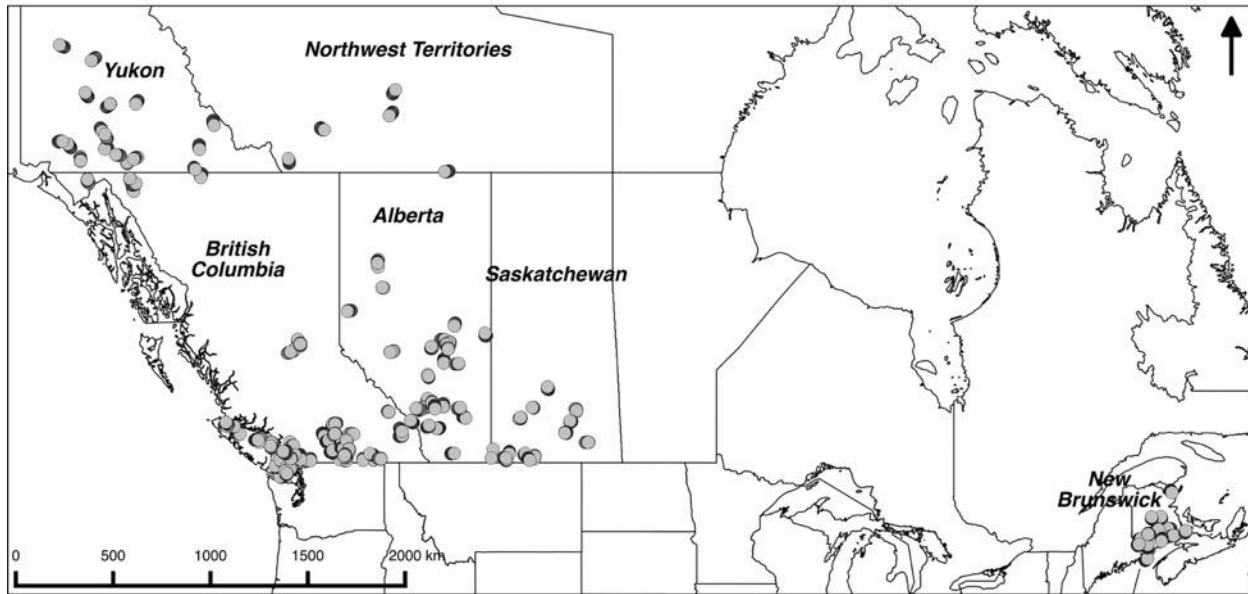
After so many big changes to the WildResearch Nightjar survey in 2016, the goal of the 2017 was to build on the support and enthusiasm that had been established. Once again surveys were conducted in 6 different regions across Canada: Alberta, British Columbia, New Brunswick, Northwest Territories, Saskatchewan, and the Yukon. The program saw many returning volunteers, and welcomed many new volunteers as well as two new regional coordinators. Behind the scenes, the Nightjar Atlas development team implemented the lessons learned and overhauled the data entry portal. Finally, for the first time in 4 years the WildResearch Nightjar survey program returned to a completely volunteer basis without the help of paid interns.

### 3.1. Volunteer Effort

In 2017, citizen scientists surveyed and submitted data for 146 routes (Table 1, Figure 1). Surveys were completed by 103 volunteers and 95 assistants, for a total of 198 volunteers in 2017! In total, volunteers contributed over 292 survey hours in addition to time required to reconnaissance routes and complete data entry for a total of over 750 volunteer hours.

**Table 1.** Number of WildResearch Nightjar Survey routes, stations and observers per year since 2010.

	2010	2011	2012	2013	2014	2015	2016	2017	Total
Routes surveyed	3	3	16	29	141	154	192	146	<b>684</b>
Stations surveyed	19	33	156	301	1,716	1,837	2,066	1,681	<b>7,809</b>
Observers	2	2	10	20	73	99	139	103	<b>448</b>

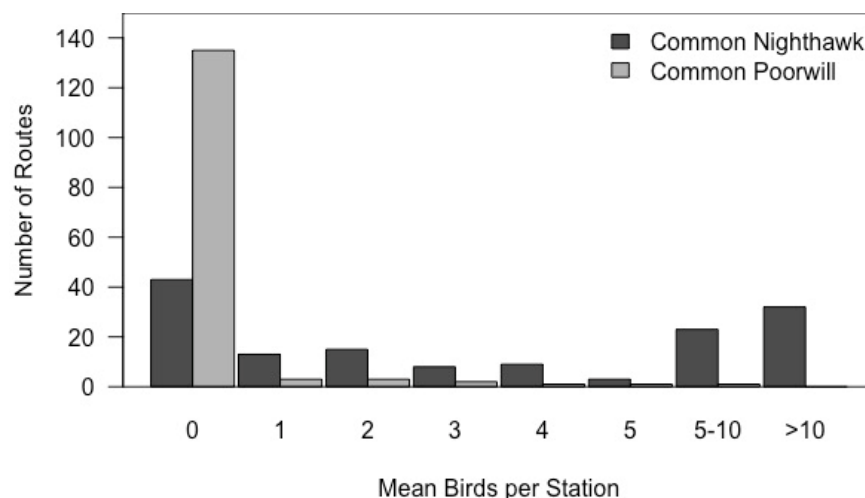


**Figure 1.** Nightjar Survey stations surveyed in 2017.

The number of routes surveyed in 2017 was the third highest number of surveys conducted for this survey program. Across Canada, there were 27 surveys conducted in Alberta, 68 in British Columbia, 14 in Saskatchewan, 18 in the Yukon, 5 in the Northwest Territories, and 15 in New Brunswick. When compared to 2016, every province had a reduction in surveys conducted, except New Brunswick, with the majority of the reductions occurring in British Columbia (28) and Alberta (11), likely due to the absence of a paid intern to boost survey numbers and help with volunteer recruitment.

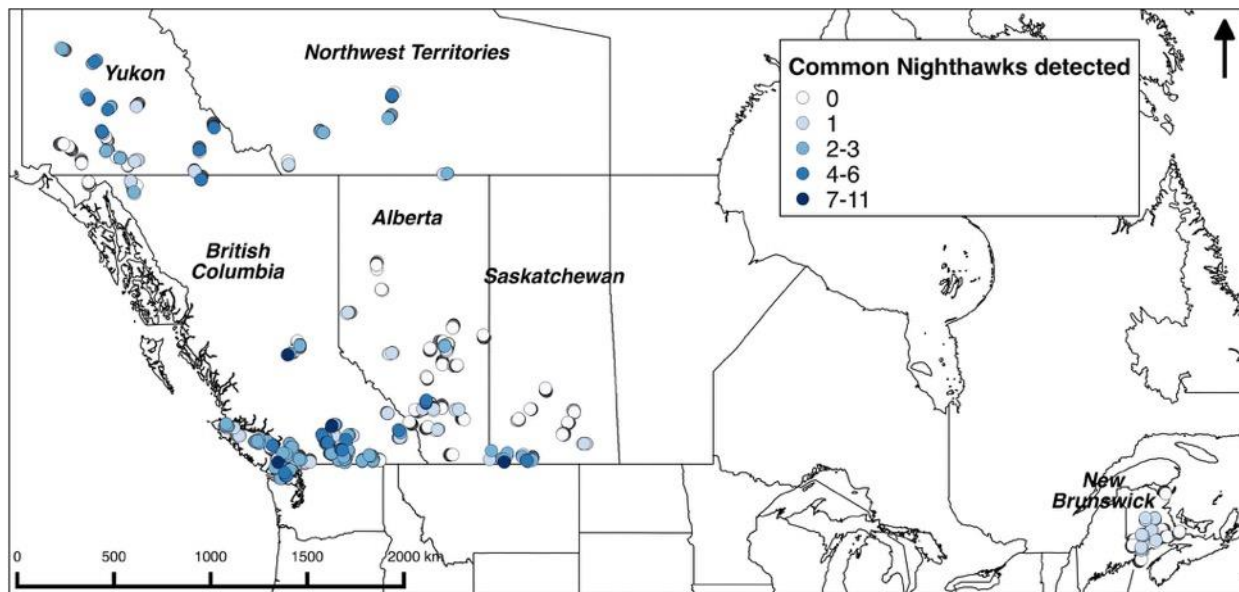
### 3.2. Common Nighthawk

Common Nighthawks were detected at 103 of the 146 routes surveyed (71%), and at 464 of the 1,681 stations surveyed (28%). In total, 858 Common Nighthawks were detected in 2017. The mean number of Common Nighthawks per station was 0.5 across all stations, and 1.85 at stations where they were detected (Figure 2).



**Figure 2.** Frequency of mean number of nightjars detected per survey route in 2017.

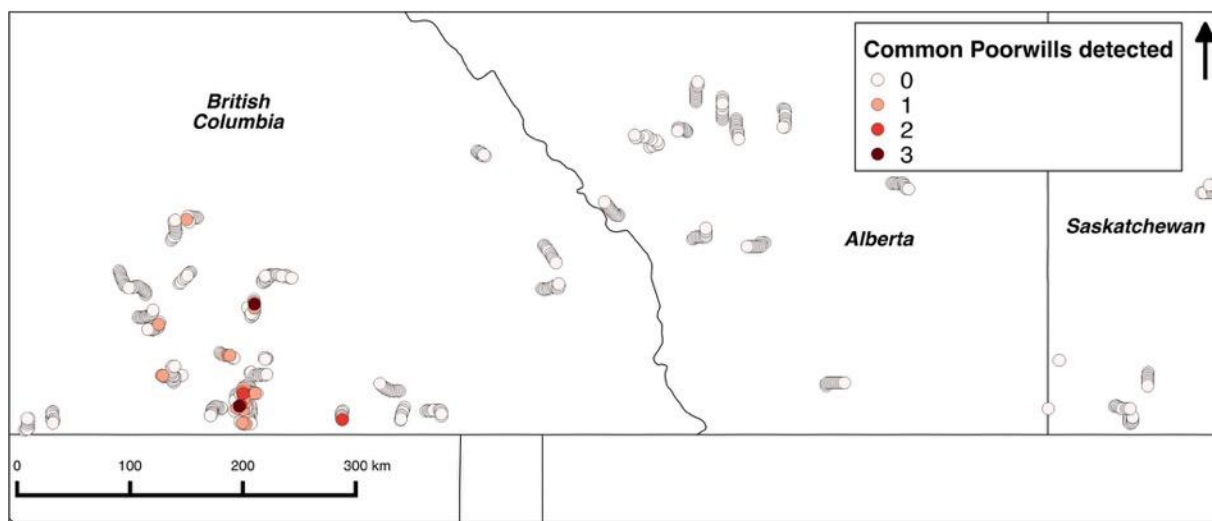
As in 2016, Common Nighthawks were detected across all regions surveyed in 2017 (Figure 3). The highest number of nighthawks per station and route were 11 and 29, respectively, both in the south central British Columbia region near Kamloops and Kelowna. Relatively high abundances were also detected along routes in southern and central British Columbia, southern Saskatchewan, and both in the Yukon and the Northwest Territories.



**Figure 3.** Abundance of Common Nighthawks detected at stations surveyed in 2017.

### 3.3. Common Poorwill

In total, 32 Common Poorwills were detected in 2017. The mean number of Common Poorwills per station was 1.3 at stations where they were detected (Figure 2). The maximum number of Common Poorwills detected at a station was 3 at two different stations, both of which are in south central British Columbia (Figure 4).



**Figure 4.** Abundance of Common Poorwills detected on routes surveyed in 2017.

True to their range, Common Poorwills were detected in central British Columbia; but none were detected in southwestern Saskatchewan in 2017 (Figure 5). Similar to 2016, no Common Poorwills were detected in Alberta in 2017. As in previous years, citizen scientists recorded particularly high abundances in the southern most area of central British Columbia (Okanagan Valley).

### **3.4. Eastern Whip-poor-will**

Two Eastern Whip-poor-wills were detected during the 2017 WildResearch Nightjar Survey. The two birds, detected at two different survey stations on the same survey route, were detected Southeast and East of MacDougall Lake in New Brunswick. These two Eastern Whip-poor-wills are the first detections of their species during the WildResearch Nightjar Survey.

### **3.5. Regional Updates**

#### **3.5.1. British Columbia**

*By Paul Preston, British Columbia Regional Coordinator*

This year, the WildResearch Nightjar Survey in British Columbia covered 71 routes, a little less than last year. As per usual, we had many volunteers in the Southwest of the province as well as in the Okanagan and Thompson regions. Of those 71 routes that were surveyed this year, 58 of them picked up Common Nighthawks only and 11 of them also detected Common Poorwills. We communicated with many amazing volunteers who were all very excited about the surveys this year. We did not run any orientations in this season in BC. However, this year I did lead a short tour during the Meadowlark Festival in mid-May in Penticton all about the Mysterious Nightjars of the South Okanagan and the South Okanagan Naturalist Club asked me to give a talk about nightjars at their AGM. Thank you to all the very enthusiastic and patient volunteers this year. I look forward to next summer and in the meantime, happy birding!

#### **3.5.2. Alberta**

*By Elly Knight, Alberta Regional Coordinator*

Sincere thanks to all the nightjar surveyors in Alberta this year! We surveyed 26 routes across the province this year, from north of Ft. McMurray and Peace River to south of Lethbridge. Common Nighthawks were detected at 12 of those 26 routes. No Common Poorwills were detected again this year, but there were no surveys in the area where this species is most common in Alberta.

We also hosted an orientation for new volunteers in Edmonton, where we spotted several Common Nighthawks booming and chasing each other against a beautiful sunset! I also had the pleasure and opportunity to give a talk for the Edmonton Nature Club's Bird Study group about nightjar conservation in Canada and the WildResearch Nightjar Survey.



*Citizen scientists spot Common Nighthawks at the 2017 Edmonton orientation. Photo: Jonathan DeMoor*

### **3.5.3. Saskatchewan**

*By Shayna Hamilton, Saskatchewan Regional Coordinator*

The second year of surveys in Saskatchewan has concluded and I would like to thank our dedicated volunteers who have continued to make the Nightjar survey a success! This year our 11 volunteers were able to complete 15 routes. A total of 60 Common Nighthawks were detected on the surveys! We were also able to have our first route retired for being surveyed two years in a row! Now that we have established the program, my goal for next year is to expand the awareness of the surveys further across Saskatchewan! I hope to hear from everyone again next year and congratulations to all the successful surveys across Canada!

### **3.5.4. Yukon**

*By Andrea Sidler, Yukon Regional Coordinator*

A big "thank you" goes out to all the citizen scientists of the Yukon for making the second year of nighthawk surveys in the territory a success!! Volunteers patiently attempted and re-attempted routes, during our rainy and windy summer, with a total of 18 routes being surveyed across the territory. Common Nighthawks were detected on 12 of these routes – which is really great! While the majority of surveys were located in more south central parts of the Yukon, routes reached almost as far North as Dawson City.





*Camouflaged female Common Nighthawk incubating near Pelly Crossing, YT. Photo: Andrea Sidler*

Volunteers detected a total of 88 Common Nighthawks across the territory during the 2017 survey season. The Little Salmon River and Silver Trail routes were in the running for the highest number of detections per route, with Little Salmon River coming out on top at 18, compared to 17, birds. Interestingly, all of the 18 nighthawks detected on the Little Salmon River route were repeat wing-booming birds! The high relative abundance of wing-booming detections suggests that the open habitat created by the recent burn, which this route intersects, likely supports a fair number of breeding Common Nighthawks. In addition to nighthawks, surveyors also reported regularly being serenaded by Swainson's Thrushes along

with the occasional winnow of a Wilson's Snipe.

Thank you again to all of our dedicated and enthusiastic volunteers who made this season possible and in particular for the high "volunteer effort per route" this year! As well, thank you to the Whitehorse Canadian Wildlife Service office for contributing their data to this project.

### **3.5.5. New Brunswick**

*By Virginia & Alex Noble-Dalton, New Brunswick Regional Coordinators*

It was fantastic to undertake the second season of the WildResearch Nightjar Survey in New Brunswick this past year, and to see the support and enthusiasm for this survey program growing. This past year, an orientation session was held in Minto, New Brunswick on the first day of the survey season. This was the first time that this survey route was undertaken and although things were relatively quiet, there was one Common Nighthawk heard on the survey and three moose to wave "hello" to on the drive home.

Overall, a total of 15 survey routes were surveyed in New Brunswick in 2017 (with interest in an additional 4 routes). 11 of these survey routes were also surveyed during the inaugural New Brunswick season (2016), and thus it is exciting to see the time series for these routes beginning. Again, the majority of the surveys were conducted in the southern half of the province with the exception of the route near Caraquet, NB. During the surveys, a total of 17 Common Nighthawks were observed, 1 of which was recorded to be wing booming. Two Eastern Whip-Poor-Wills were also observed; these are the first detections submitted of their species during the WildResearch Nightjar Survey. The two birds were detected at two different stations near MacDougall Lake. The highest occurrences of Common Nighthawks were on the Holtville and Blackville routes, each with four individuals. The surveys also recorded two occurrences of Barred Owls. We also received two additional reports by email of Eastern Whip Poor-Wills in the province and 3 more reports of Common Nighthawk (12 to 15 birds total). We look forward to continuing building on the success of the survey season for next year's WildResearch Nightjar Survey. In particular, we are hoping to have the survey instructions translated to French, which should aid in targeting the largely francophone population of Northern New Brunswick. We also plan to expand into Nova Scotia next year, and build upon the survey program initially established by Environment and Climate Change Canada. Finally, a big thank you goes out to the New Brunswick Naturalist clubs and all who helped us advertise our program. In particular, we would like to thank the Saint John Naturalists Club, Fredericton Nature Club, Club de Naturalistes de la Peninsula Acadienne, the Birding and Nature in Restigouche Group and CBC Radio's Shift New Brunswick.



*Male Common Nighthawk prior to receiving a GPS tag for a study on migratory connectivity. Photo: Virginia Noble-Dalton*

In addition, during the WildResearch Nightjar Survey season, we (Virginia and Alex) also had the chance to assist in the Common Nighthawk Migratory Connectivity Project. The project is collaboration between the University of Alberta, Environment and Climate Change Canada, the Smithsonian Migratory Bird Center, Bird Studies Canada, and many more. For this project, we used mist nets to catch four male Common Nighthawks and attached a GPS tag to 3 of the 4 birds as a tiny backpack. By tracking these birds using this light, cutting-edge technology, the project aims to learn about the Common Nighthawk's migration.

### **3.5.1. Northwest Territories**

*By Rhiannon Pankratz, Northwest Territories Regional Coordinator*

A huge thank you to the two surveyors who ran 5 routes and counted 46 individual Common Nighthawks! It's a large territory to cover and many routes are hours from human habitation, so thank you for your tremendous efforts! Of the 60 stations surveyed (5 routes x 12

stations), 27 or almost 50% had Common Nighthawk detections. Where Common Nighthawks were detected, over half of the stations had more than one individual, with one location having 4 birds. At the route level, detections ranged from a single individual to 18, meaning that all routes surveyed had Common Nighthawk. Thank you again for a great 2017 and looking forward to the 2018 season!

### 3.6.Route Spotlight

*By Shayna Hamilton, Saskatchewan Regional Coordinator*

Participating in the WildResearch Nightjar Surveys can take you to some of the most amazing rural places in your home province, provided you aren't afraid to hop in a vehicle for a couple hours! Nestled in the middle and most southern region of Saskatchewan is Grasslands National Park. This vast expanse of unbroken native prairie is both breathtaking and inspiring. I personally always feel in awe of the landscape whenever I arrive at the park entrance, and this was my 7<sup>th</sup> trip to the park.



*Bison travelling through Grasslands National Park. Photo: Shayna Hamilton*

This particular trip was my first trip to the West half of the park. I now understand why it is the more popular part of the park for tourists! It took only 300 meters into the park to see an enormous Bison making its way through the surrounding Black-tailed Prairie Dog town. As you drive down the twisting gravel roads at sunset you are almost guaranteed to see a Common Nighthawk flying through the darkening sky. I was delighted to pull into the tiny campground and be greeted by a Nighthawk resting on the wooden fence.



*Male Common Nighthawk roosting on a fence. Photo: Shayna Hamilton*



*Black-tailed Prairie Dogs. Photo: Shayna Hamilton*

While I did not survey the Grasslands routes this year on our sunset drive we counted at least 19 different Common Nighthawks within 45 minutes. White wing bars flew through the sky around every other corner and *Peents* echoed in the grassy river valleys. The entire experience can only be described as



*Common Nighthawks in flight. Photo: Shayna Hamilton*

mesmerizing and I can't wait to return again next year!



### 3.7.Citizen Scientist Spotlight:

*By Kris Mutafov, WildResearch Nightjar Survey Citizen Scientist*

There's something special about getting together your surveying sheets as the sun is setting. It's counterintuitive to a typical bird monitoring schedule – which is usually up before dawn, done by breakfast. Just as the golden hour is coming to a close, you roll up to the starting location, and prepare for some crepuscular science.



*Sunset on the prairies. Photo: Kris Mutafov*

I had the great opportunity to survey several Nightjar routes through south central Saskatchewan as a summer student with Nature Saskatchewan, a not for profit organization working with Species and Risk across the province. My coworker and I had been in the area doing Loggerhead Shrike surveys along 'grid roads' as prairie folk call them, and it so happened that the Nightjar monitoring routes were directly in our area.

So there we were – middle of July, in a more remote part of the southern prairie grasslands, parked at stop number 1. The air was thick with humidity, and in the distance, the odd cow could be heard mooing, or faintly, a landowner could be heard using a generator or brush cutter. Smells of swaying grass and dust drifted about. What we didn't hear was any nightjars.



Moving on to further stops, we started to notice a dark bridge of cloud on the horizon behind us. That ominous feeling that accompanies a pressure drop before a storm was growing, and sure enough, several stops later, we heard a deep, ground-shaking boom that extended for awhile and trailed off into the sky. The mosquitos grew in ferocity, and during every period of silent listening for Nightjars, periods of swatting and fidgeting were more and more common.



*The survey road ahead. Photo: Kris Mutafov*

Finally, around stop number 10, we knew that something big was coming. It was dark enough now that brilliant flashes shot across the sea of yellow and green towards us. I didn't blame the Nighthawks and Poorwills for not calling or wing-booming – heck, I was ready to jump in the vehicle and escape from this open, exposed location. I looked at our cloud data, and it



*Suboptimal conditions for nightjar surveys. Photo: Kris Mutafov*

transitioned from about 30% coverage to 100% over the stops. The storm was nearly upon us.

We did our duty to science and completed our 12 stops in the route. Unfortunately, no Nightjars were observed along the route, but zero is data nonetheless, and as we drove away back to the campground in a massive downpour, it was obvious that weather plays a quintessential role in the activity of these beings of the twilight.

The next Nightjar survey route was much less eventful, and no freak storm hindered progress in any way. Summer silence accompanied by the occasional car rolling past made for a peaceful atmosphere.

I later got the chance to survey a route on Vancouver Island, and it was a totally different experience – I had a suburban to rural area with a lot of traffic. Although the data was being recorded in the same way, I was still reminded of the storm survey route, and how sometimes, nothing can compare to the uniqueness of the Canadian prairies.

## 4. COMMON NIGHTHAWK HABITAT ASSOCIATIONS IN BC'S GRASSLANDS

*By Alessandra Hood, University of Alberta*

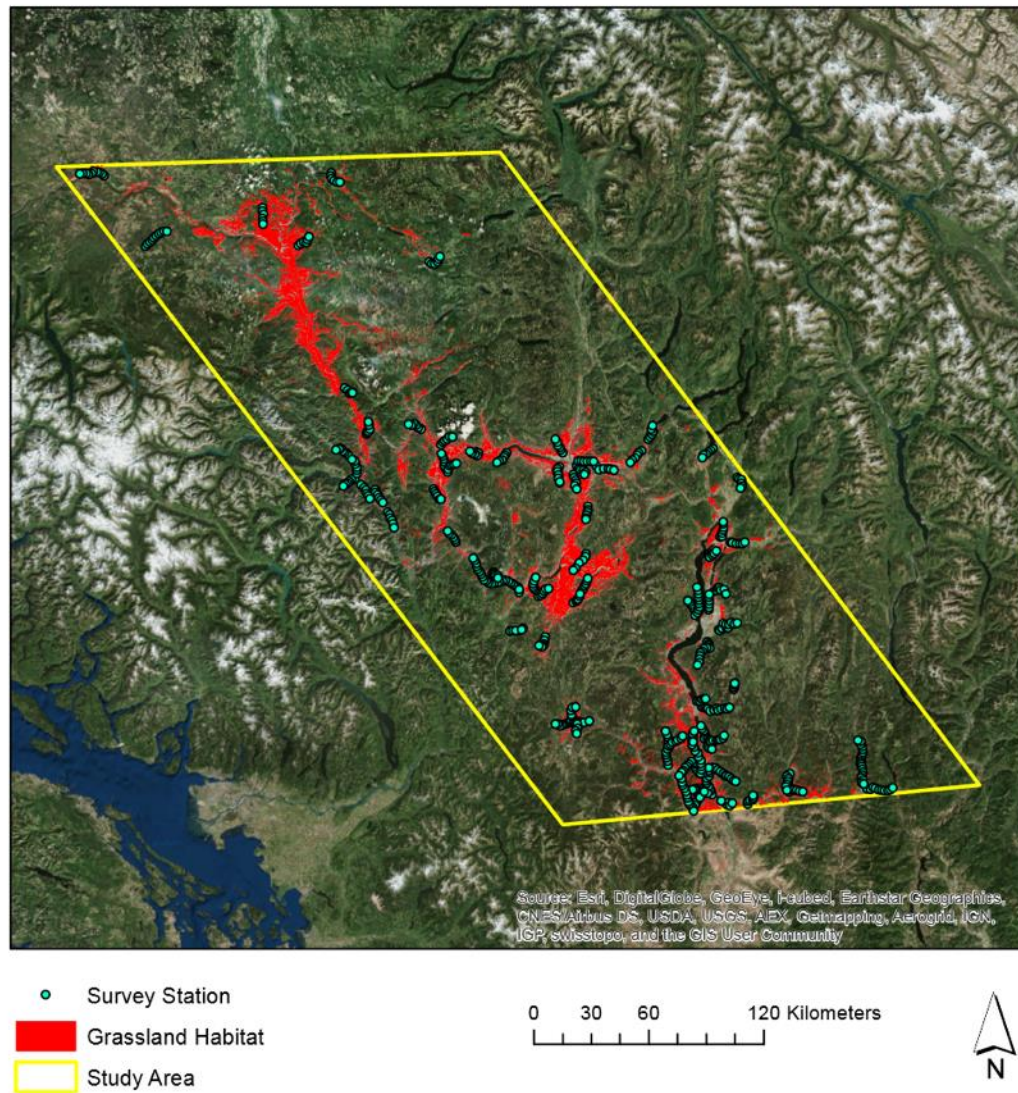
The reasons for observed declines in Common Nighthawk populations are not fully understood, thus it is important to determine which environmental and landscape features are used by Common Nighthawks to develop more effective conservation methods. Common Nighthawks are difficult to study because their crepuscular behaviour precludes their detection during traditional dawn bird surveys, but the WildResearch Nightjar Survey accounts for this crepuscular life history. Using the territorial wing-boom display of the nighthawk from citizen scientist survey data with available habitat data, we created a habitat model for nighthawks in the grassland areas of south central British Columbia for the years 2014 and 2015.

### 4.1. Methods

We used citizen science data from 2014 and 2015, along with environmental covariates to examine the relationship between landscape and environmental features on nighthawk abundance and detectability in an N-mixture model framework. Our study included a total of 396 survey stations throughout south central British Columbia, Canada (Figure 1). The area encompassed a variety of grassland habitats and 7 biogeoclimatic zones including Sub-Boreal Pine, Engelmann Spruce, Interior Douglas-Fir, Ponderosa Pine, Bunchgrass, Mountain Spruce, and Interior Cedar.

We used ArcGIS to extract landscape variables of known and predicted importance to Common Nighthawks for 2014 and 2015, including a land use or Baseline thematic map, soil layer, biogeoclimatic zone layer, grassland layer, and road layer. We used a scale-dependent design to quantify potential Common Nighthawk habitat variables by buffering each survey station with an 800 m (territory range) and 3 km (home range) radius.

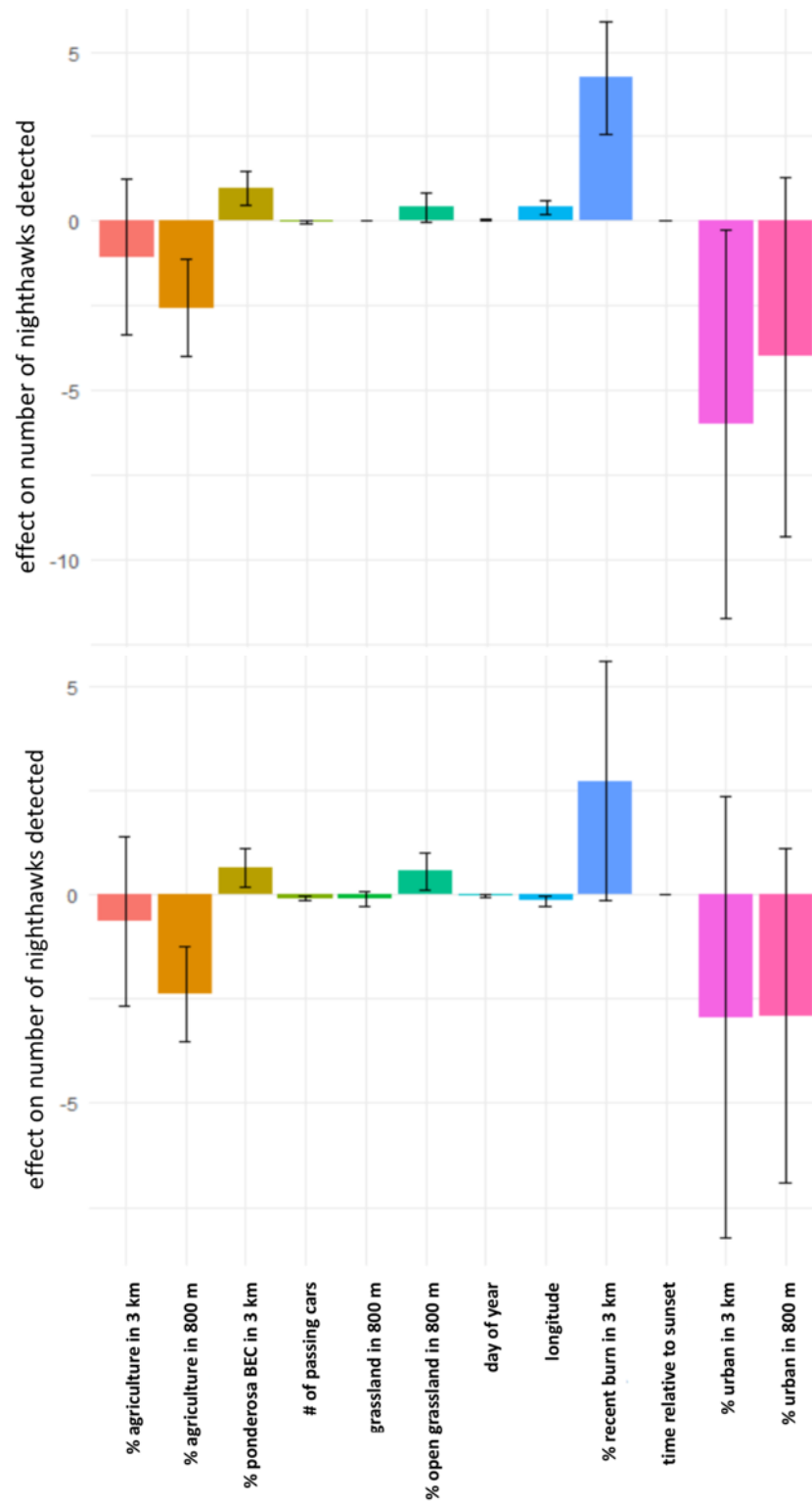
We modeled abundance of CONI at each station and probability of detection given that a bird occurs at a site using N-mixture models in the program R. The number of wing-booming birds was used as the response variable, and each minute of the survey was used as a separate visit to account for Common Nighthawk detectability into the analysis, for a total of 12 visits per survey location. We then built separate models for 2014 and 2015 and picked variables both in common and in the same direction from those two models to create a final model for each year.



**Figure 5.** A map of South Central British Columbia showing the study area outlined in yellow. The red portion shows the grassland habitat and the green shows the individual stations of each route for the years 2014 and 2015.

## 4.2.Results

In 2014, citizen scientists surveyed 396 stations throughout south central British Columbia, detecting a mean of 0.39 nighthawks wing-booming per survey, or 153 wing-booming nighthawks in total. In 2015 citizen scientists surveyed 300 stations and detected a mean of 0.68 wing-booming nighthawks per survey, for total of 203 wing-booming nighthawks. The final N-mixture model analysis for 2014 and 2015 consisted of nine habitat variables related to Common Nighthawk abundance: the proportion of Ponderosa Pine biogeoclimatic zone within 3 km, longitude, the proportion of open grassland within 800 m, the proportion of all grassland 800 m, the proportion of agricultural area within 800 m and



**Figure 6.** Coefficients for proportions of different habitat covariates for 2014 (top) and 2015 (bottom). Colored bars show either a positive effect (above zero) or effect (below zero) on nightjars. Error bars represent a 95% confidence interval.



3 km, the proportion of urban area within 800 m and 3 km, the proportion of recently burned area within 3 km. The final models also consisted of three variables related to Common Nighthawk detectability: the number of passing cars, the survey time relative to sunset, and the day of the year (Figure 6).

In both years, the abundance of Common Nighthawks was positively related to the proportion of ponderosa pine biogeoclimatic zone and recently burned habitat at the home range scale. Nighthawk abundance was also positively related to the proportion of open grassland, but at the territory scale. The proportion of agriculture at the territory scale was strongly negatively related to Common Nighthawk abundance. Although agriculture at the home range scale also had a negative effect on nighthawk abundance, it was not significant in either year and had a higher uncertainty in effect size than at the territory scale (Figure. 2). Car, day of year, and time relative to sunset had small effects on detectability (Figure 6).

### 4.3. Discussion

N-mixture models showed that the amount of open grassland at the territory scale, and ponderosa pine biogeoclimatic zone and recently burned habitats at the home range scale had a positive effect on Common Nighthawk abundance, while agriculture and urban land at the territory scale had a negative effect on abundance. These results suggest agricultural and urban areas do not provide breeding habitat for Common Nighthawks in south central British Columbia, and conservation efforts need to be focused on preserving habitats such as open grassland and ponderosa pine forest. Scale should be considered as well when developing management recommendations, since our results suggest Common Nighthawks respond differently to habitat between the territory and home range scale. Our findings also suggest Common Nighthawk survey data collected by citizen scientists can be used to determine habitat associations and should continue to be used as a tool in nightjar conservation research. Understanding these habitat associations is the first step towards developing better conservation management solutions for this species.

## 5. OTHER ACCOMPLISHMENTS IN 2017

In addition to the citizen science surveys completed in 2017, the WildResearch Nightjar Survey also completed several other objectives.

### 5.1. Nightjar Atlas

Following the launch of the WildResearch Nightjar Atlas in 2016, we realized that the data entry portal portion of the atlas needed some improvement. With the help of thoughtful comments from our volunteers and in-kind assistance from the Community Mapping Network, we overhauled the data entry portal. In this 2017 iteration, we formatted the data entry portal similar to the data forms that observers fill out in the field to make the process easier. As a result, the number of routes entered through the atlas increased from 41% to 77% between 2016 and 2017! While there remain a few minor flaws in the data entry portal,

we are happy with its performance and grateful to our citizen scientists for embracing it! That being said, we are always happy to receive data submissions by email or mail.

Add Survey

Select all

Edit selected

	Route	Start Temp	End Temp	Day	Month	Year	Comments	Assistant 1	Assistant 2	Assistant 3	Observer Id
<input type="checkbox"/>	Charters Settlement	19	16	5	July	2017					

Stop Conditions

Add

Edit

	Station Id	Hour Start	Minute Start	Wind Speed	Cloud Cover	Moon Visible	Noise Code	Cars	Station Condition
<input type="checkbox"/>	Nightjar Observations 1	20	49	1	1	Yes	1	1	
<input type="checkbox"/>	Nightjar Observations 2	20	58	1	1	Yes	1	0	

Nightjar Observations

Add

Edit

Delete

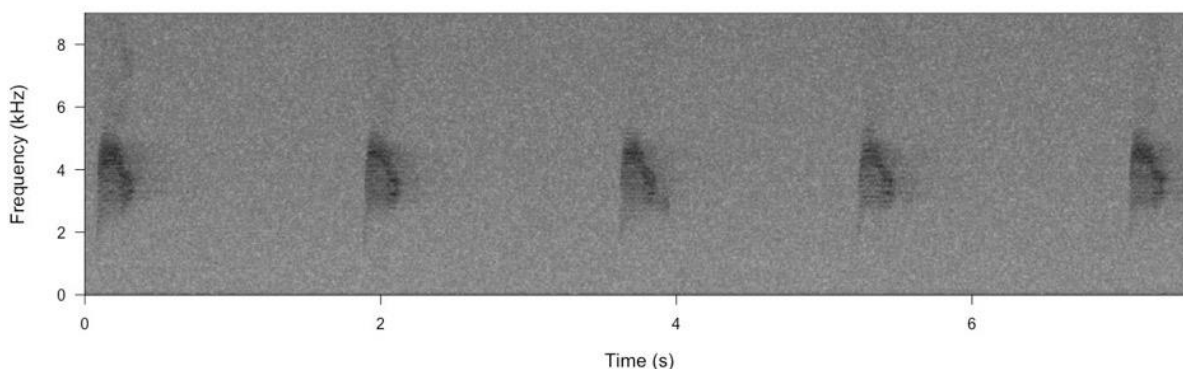
	Species Code	Minute 1	Minute 2	Minute 3	Minute 4	Minute 5	Minute 6	Repeat Wingboom	Distance	Direction	Comments
<input type="checkbox"/>	CONI	C (Call)	C (Call)	C (Call)	N (Not Detected)	N (Not Detected)	N (Not Detected)	N			

<input type="checkbox"/>	Nightjar Observations 3	21	10	1	1	Yes	1	1	
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*The new data entry portal on the WildResearch Nightjar Atlas.*

## 5.2.Bioacoustic Processing

From 2014 – 2016, the WildResearch Nightjar Survey collected audio recordings at various locations in central British Columbia. Those recordings have been used for several research projects to date and were also recently also used to train a series of computer programs to automatically detect calls of the Common Nighthawk as part of a collaborative research project between the University of Alberta, the University of Regina, and Environment and Climate Change Canada. That research was published in the journal *Avian Conservation and Ecology* and is publicly available online as part of a bioacoustics special issue at <https://www.ace-eco.org/vol12/iss2/art14/>.



*Spectrogram of Common Nighthawk vocalizations.*

### 5.3. Contribution to Common Nighthawk Recovery

We are excited to announce that the entire WildResearch Nightjar Survey dataset was recently contributed to a national database that will be used for conservation planning for Common Nighthawks. To learn more about the conservation management of Common Nighthawks, check out the Recovery Strategy online at

[http://www.sararegistry.gc.ca/document/default\\_e.cfm?documentID=2728](http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=2728).

### 5.4. Appreciation Project

This year, we gifted drink coasters to the 2017 volunteers as a token of our appreciation. We sent each citizen scientist a thank-you note and two coasters so they could 'have a drink on us'. In addition, this year we had five volunteers hit the five years of surveys milestone! We're busy designing a custom t-shirt to thank those volunteers for all their hard work, which will also be available in future years for five-year milestone volunteers.



*Nightjar drink coasters to say thanks to our 2017 volunteers!*

### 5.5. Route Assessment

Following the Canadian Nightjar Survey Protocol, survey routes are reassessed every year to transition the program from habitat objectives to long-term monitoring objectives. Routes that have been surveyed for two years without a nightjar detection are removed from the regular list of available routes to a "zero" route list. These zero routes will be made available again every five years to ensure monitoring is capable of documenting range expansions. 2017 was the first year of survey route assessment.



*Female Common Nighthawk with chick. Photo: Elly Knight*

## 6. FUTURE PLANS

In the long-term, we will continue working towards our multi-species and single-species objectives. We will continue to encourage the use of our data by students and researchers across Canada, and continue to communicate our findings with stakeholders and the public.

### 6.1. Further Expansion

The WildResearch Nightjar Survey is growing again! We are in the planning stages of opening one new chapter and expanding one chapter for the 2018 survey season.

#### 6.1.1. New Ontario Chapter

We are super excited to announce an Ontario chapter for 2018! Ontario is an important region to survey for nightjars because Common Nighthawk declines are particularly steep in this province, and because Ontario is also home to the most abundant Eastern Whip-poor-will populations in the country.

The launch of the Ontario chapter is being made possible thanks to our new Ontario Regional Coordinator, Elora Grahame! Elora Grahame is a graduate student in the Norris lab at the University of Guelph and is studying survival and reproductive success of breeding Common Nighthawks in Ontario. Originally from Massachusetts, Elora attended Penn State University for her undergraduate degree, where on several occasions she heard seasoned birders lamenting the absence of nighthawks in areas where they had been encountered regularly decades before. She is interested in conservation biology and has experience banding



Northern Saw-whet Owls and migratory passerines as well as conducting point count surveys and nest-searching for ornithological research.

### **6.1.2. Maritimes Chapter**

The New Brunswick chapter is expanding into a Maritimes chapter! Regional Coordinators Virginia and Alex Noble-Dalton have offered to take on another province's worth of survey routes and volunteers. The Maritimes chapter will combine the existing New Brunswick routes with a set of routes from Nova Scotia that were surveyed by Environment and Climate Change Canada in 2016. We look forward to continuing to survey those routes for Common Nighthawks and Eastern Whip-poor-wills!

### **6.2. Protocol Translation**

After much patience from our Francophone volunteers, we are excited to announce the Canadian Nightjar Survey protocol is available en Français! The translation was contributed in-kind Kevin Quirion Poirier and Audrey Lauzon. We are deeply thankful to Kevin and Audrey for this substantial contribution!

### **6.3. Survey Method Comparison**

As we look towards transitioning the WildResearch Nightjar Survey from habitat objectives to long-term monitoring objectives, we want to make sure that the program will actually increase our ability to detect changes in nightjar populations. To investigate this question, we are initiating a research project that will compare the WildResearch Nightjar Survey to the Breeding Bird Survey. Because the Canadian Nightjar Survey Protocol makes use of the Breeding Bird Survey route network, we can conduct a direct comparison between the two survey programs. We look forward to sharing the results of this project in the future!

