

BC Nightjar Survey 2014 Annual Report



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The BC Nightjar Survey is a program under non-profit organization, WildResearch. WildResearch identifies and develops solutions to conservation issues using a multi-disciplinary approach. Our primary goals are research and monitoring of wildlife, environmental education, and community engagement through training and outreach.



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*The BC 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 BC Nightjar Survey volunteers!

Executive Summary

WildResearch's BC Nightjar Survey is a citizen science program that conducts nocturnal roadside surveys for two highly understudied species of conservation concern, the Common Nighthawk and the Common Poorwill. Both species belong to the nightjar family, which is a group of cryptic migratory birds that forage for flying insects at night. Both species are understudied because their nocturnal habits exclude them from detection during other survey programs like the Breeding Bird Survey. Data that is available for nightjars indicates their populations are in decline, and the Common Nighthawk has been 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 the Committee on the Status of Endangered Species 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 2014 season was a pivotal year for the BC Nightjar Survey because WildResearch expanded the surveys to the entire province. From 2010-2013, the BC Nightjar Survey was restricted to the Okanagan region in south central BC. In 2014, BC Nightjar Survey volunteers completed 141 survey routes, which is a 500% increase over the 2013 surveys. Volunteers completed surveys in many areas of the province, including the northwestern corner of the province near Atlin, BC. Although Common Nighthawks were not detected on every route surveyed, they were detected in all surveyed regions. Common Poorwill detections were made in several locations that are new for the BC Nightjar Survey.

Several improvements to the BC Nightjar Survey protocol were introduced in 2014 to ensure each nightjar species is surveyed for at the optimal time. Common Poorwills are nocturnal and so begin calling when it is dark, while Common Nighthawks are crepuscular, which means they are most active at dusk. Amendments involved creating separate protocols to reflect the two species varying ranges and life histories. Preliminary analyses of the 2014 survey data indicate that overall, the changes made have increased the number of nightjars detected by the BC Nightjar Survey.

Development and refinement of the BC Nightjar Survey will continue for the next several years to optimize the program for long-term monitoring. Improvements for the 2015 BC Nightjar Survey season will include new data entry and waiver form systems that make it even easier for citizen scientists to participate. WildResearch is also working to increase the sense of community among volunteers, and forming new collaborative working relationships with non-profit, academic, and government organizations across North America.

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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. In British Columbia (BC), we have two species of nightjars: the Common Nighthawk (*Chordeiles minor*) and the Common Poorwill (*Phalaenoptilus nuttallii*). The Common Nighthawk is found across North America during the breeding season and forages on the wing at dawn and dusk (i.e., is “crepuscular”). In contrast, the Common Poorwill is found only in south central BC and forages by sallying from a perch or the ground at night.

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 aerial insectivore species have been detected across North America. Although nightjar species are often missed by other bird survey programs (e.g., Breeding Bird Survey), available data indicates many nightjar populations in Canada are also in decline. The Common Nighthawk is 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 the Committee on the Status of Endangered Species in Canada (COSEWIC) because sufficient surveys have not been completed.

Nocturnal roadside citizen science surveys are an ideal method to study nightjars in BC and thus contribute to their conservation. The nocturnal nature of these birds requires that survey stations must be accessible for surveyor safety. Furthermore, travelling by car allows surveyors to travel quickly between stations that are far enough to ensure birds are not double counted. Citizen science surveyors ensure adequate survey coverage because the Common Nighthawk in particular is found all across British Columbia. Data collected by citizen scientists during the nocturnal roadside surveys will allow for analysis of detectability, species range, habitat preference, occupancy, and population trends of these otherwise cryptic birds. Lastly, citizen scientists contribute invaluable local knowledge to the project including incidental nightjar reports and information about route accessibility and local habitat.

1.3. Program Objectives

The goal of the BC Nightjar survey is to contribute to the conservation and recovery of nightjars in BC. Two objectives have been identified for each nightjar species in order to achieve this goal:

1.3.1. Common Nighthawk

- Determine the population trends of Common Nighthawks in BC.
- Determine the types of landscapes in BC that are important for conserving Common Nighthawk Populations.

1.3.2. Common Poorwill

- Determine the population trends of Common Poorwills in BC.
- Determine the species range of the Common Poorwill in BC.

1.4. Program Background

The BC Nightjar Survey was restricted to south central BC from 2010 to 2013 and expanded to the rest of the Province in 2014. The first three years of the BC Nightjar Survey were conducted in the Okanagan region in order to target an area where both nightjar species 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 surveys were expanded to survey for the Common Nighthawk across their range in BC in order to contribute to federal recovery efforts. Also in 2014, the BC Nightjar Survey protocol was amended to ensure each nightjar species is surveyed for at the optimal time. Improvements involved creating separate protocols to reflect the two species varying ranges and life histories.

2. BC NIGHTJAR SURVEY METHODS

2.1. Survey Protocol

Roadside surveys, beginning at dusk, are used to survey BC's two nightjar species. Each survey route is a series of 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.

For further details, please visit the WildResearch website for copies of the BC Nightjar Survey protocols:

<http://wildresearch.ca/programs/bc-nightjar-surveys/information-for-surveyors/#Resources>

2.1.1. Two-Species Zone

The Two-Species Zone is the area of BC where both Common Nighthawks and Common Poorwills are likely to occur. In the Two-Species Zone, each survey route consisted of six survey stations. During a survey, the surveyor conducted a roadside point count at each survey station, starting 30 minutes before local sunset to target Common nighthawks. At

30 minutes after local sunset, the same six stations were surveyed in the reverse direction to target Common Poorwills. In 2014, surveys were conducted in the Two-Species Zone between May 15th and June 30th.

2.1.2. One-Species Zone

The One-Species Zone is the area of BC where only the Common Nighthawk occurs. In the One-Species Zone, each survey route consisted of ten survey stations. Each of the ten survey stations was surveyed only once starting at 30 minutes before local sunset. In 2014, surveys were conducted in the One-Species Zone between June 1st and July 15th.

2.2. Survey Locations

As the BC Nightjar Survey developed between 2010 and 2014, the method used to select survey route locations varied. The vast majority of routes were selected in 2014 using a stratified random selection process and the remaining routes were placed subjectively based on volunteer availability. Stratified random selection was conducted using aerial photography in a geographic information system (GIS). Routes were selected within several priority regions in order to assign routes across a gradient of human disturbance. Routes began at points that were randomly placed on a map of roads within each priority region. Routes within heavily forested areas were omitted because nightjars require some open area for suitable habitat. The remaining routes were selected in 2010 were subjectively placed based on Common Poorwill occurrence.

Survey station locations were determined by citizen scientists in order to ensure each survey station was in a safe location to pull over. In general, locations were determined on the ground using a car odometer to ensure stations were at least 1.6 km apart. The location of each station was recorded using a global positioning system (GPS) so that the same location could be surveyed again in subsequent years.

3. SUMMARY OF 2014

The 2014 BC Nightjar Survey season marked a turning point in the trajectory of the program. Protocol changes and an expansion of the program were coupled with enormous response from the citizen science birding community in BC. Development and refinement of the BC Nightjar Survey will continue for the next few years to optimize the program for long-term monitoring. Data analysis for the first few years of the program will be primarily descriptive while we collect enough baseline data to undertake more complex analyses such as population trends and habitat associations. Below is a basic summary of the volunteer effort and results for each survey zone, as well as Survey Route & Citizen Scientist Spotlight articles.

3.1. Volunteer Effort

In 2014, citizen scientists surveyed and submitted data for 141 survey routes: 83 routes in the Two-Species Zone and 58 routes in the One-Species Zone (Figure 1). Surveys were completed by 101 volunteers and a field course of students, who completed our most northern routes near Atlin, BC. In total, volunteers contributed 386 survey hours.

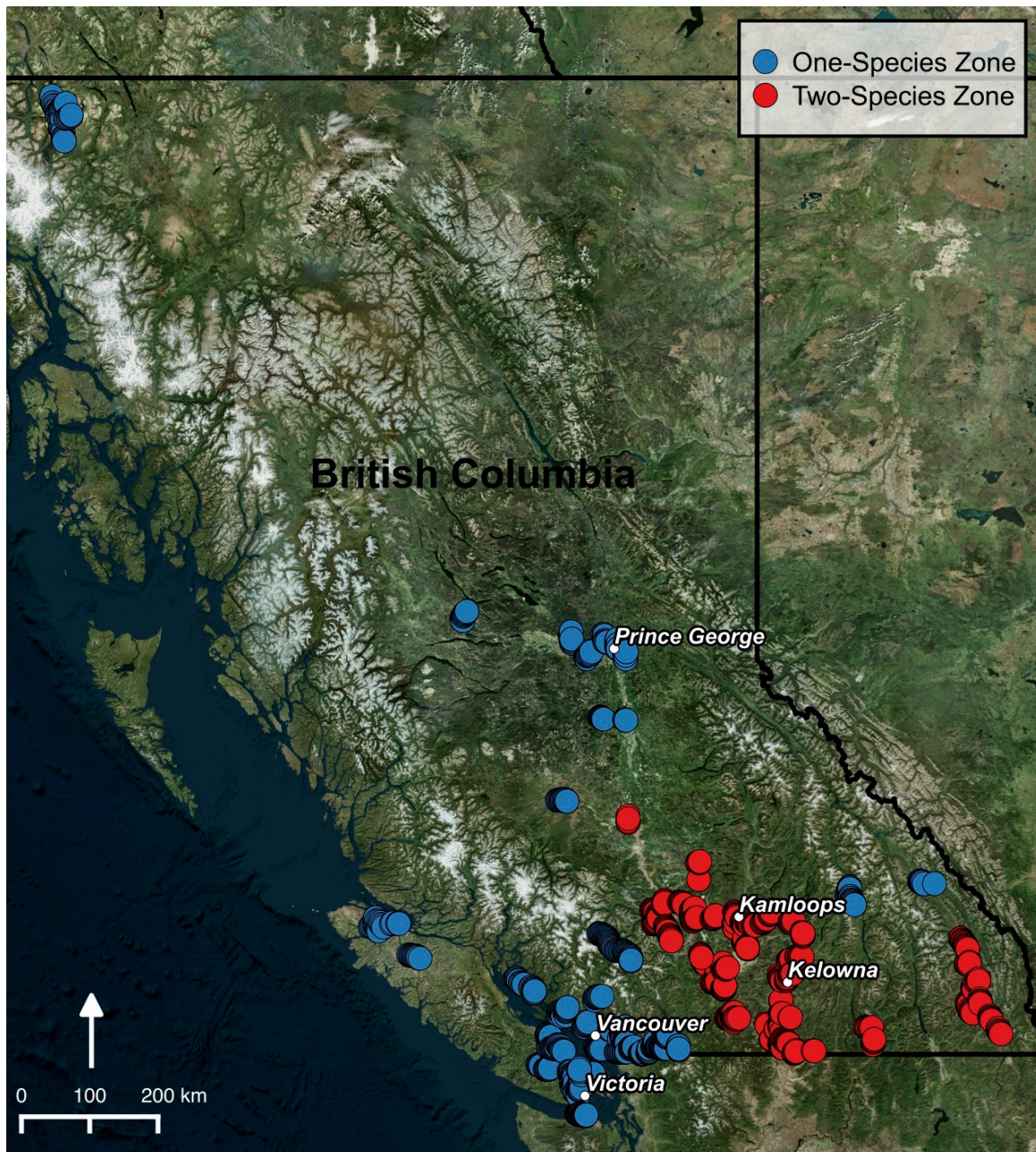


Figure 1. BC Nightjar Survey stations surveyed in 2014.

Thanks to all the BC Nightjar Survey citizen scientists, survey effort increased almost 500% between 2013 and 2014 (Table 1). The number of surveys completed was partially due to the expansion of the program into the One-Species Zone and partially to a large increase in effort in the Two-Species Zone. Since the start of the program in 2010, volunteer contributions in the Two-Species Zone have grown annually.

Table 1. Number of BC Nightjar Survey routes completed per year since 2010.

	2010	2011	2012	2013	2014	Total
Two-Species Zone	3	3	16	28	83	133
One-Species Zone	0	0	0	1	58	59
Total	3	3	16	29	141	192

3.2. Two-Species Zone

Common Nighthawks were detected at 72%, or 60 of the 83 Two-Species Zone routes surveyed in 2014, for a total of 533 Common Nighthawks (Figure 2). Common Poorwills were detected at 40%, or 33 of the 83 routes surveyed in 2014. In total, 112 Common Poorwills were counted during surveys in the Two-Species Zone.

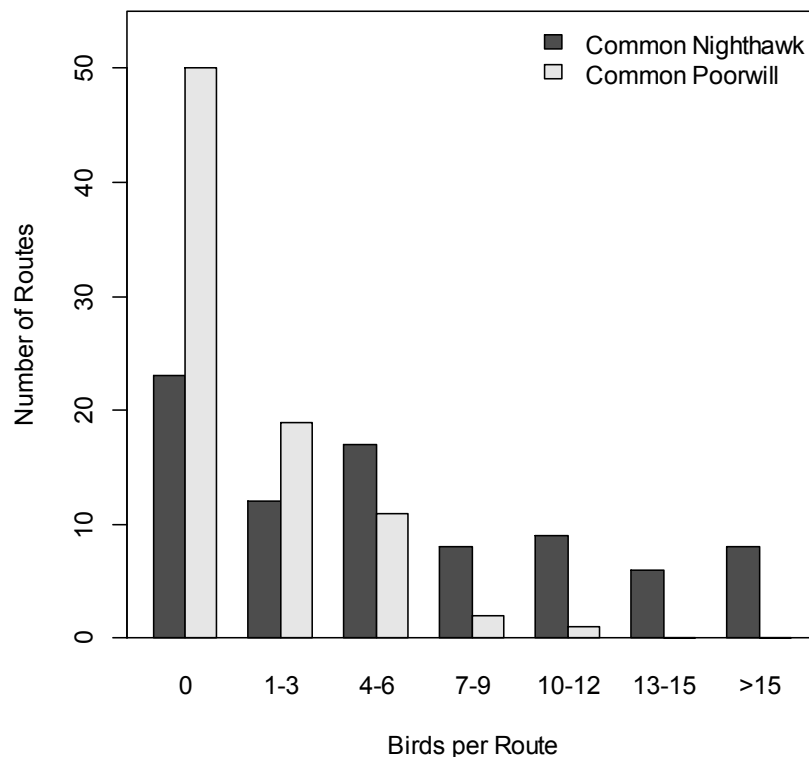


Figure 2. The number of nightjars detected on routes surveyed in the Two-Species Zone.

3.3. One-Species Zone

Common Nighthawks were detected at 60%, or 35 of the 58 routes surveyed in the One-Species Zone, for a total of 239 Common Nighthawks (Figure 3). On average there were four Common Nighthawks detected per survey route, and detection per route ranged from 0 to 40 birds.

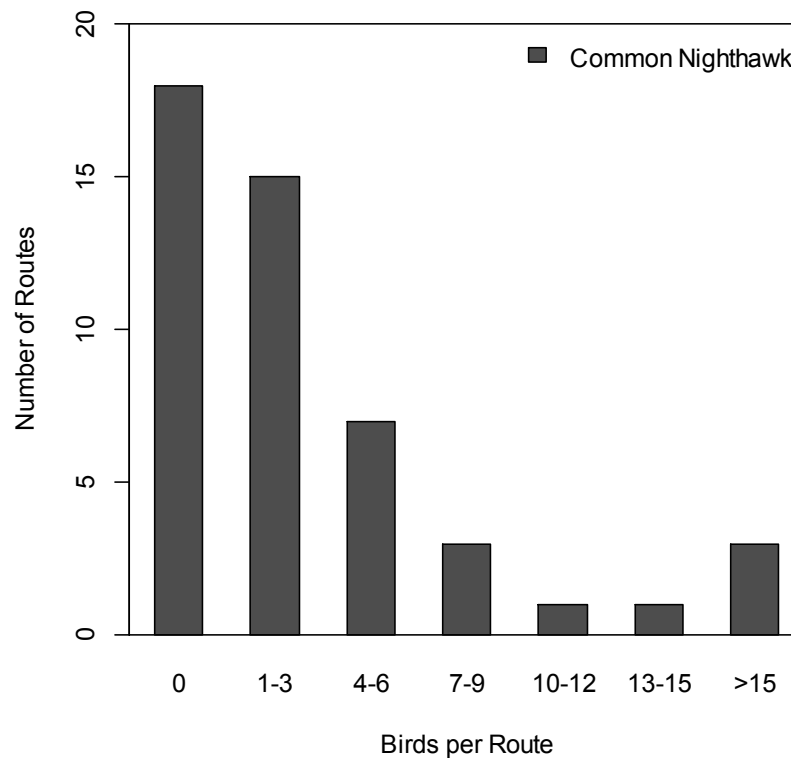


Figure 3. The number of Common Nighthawks detected on routes surveyed in the One-Species Zone.

3.4. Common Nighthawk Hotspots

Common Nighthawks were detected in all regions surveyed in 2014 (Figure 4). Relatively high abundances of Common Nighthawks were reported on southern Vancouver Island, the Cariboo Chilcotin (central BC), the north Okanagan valley (south central BC), and around Lillooet (west of Kamloops). In contrast, Common Nighthawks were rarely detected in the area around Prince George and the Lower Mainland.

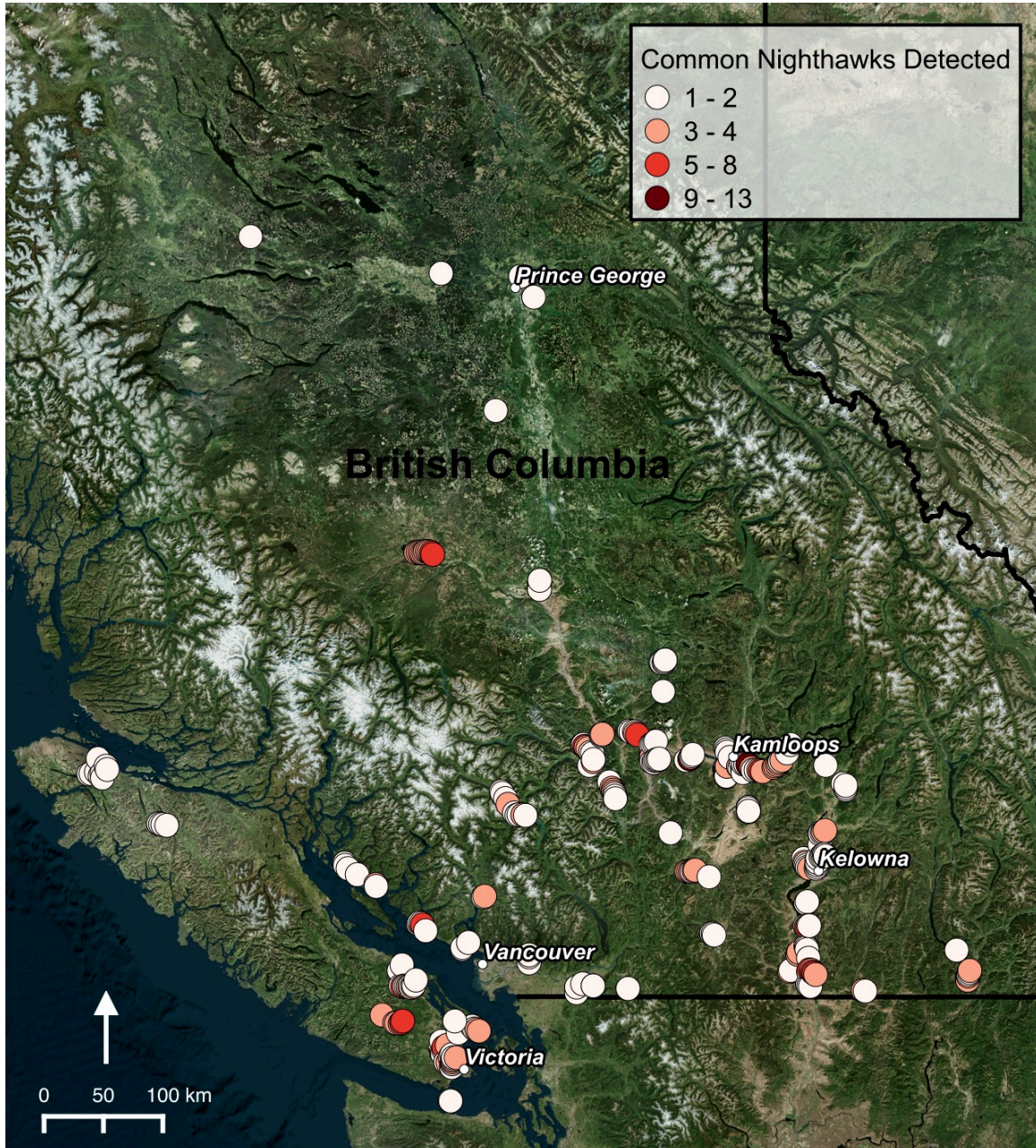


Figure 4. Abundance of Common Nighthawks detected at survey stations during the BC Nightjar Survey in 2014 (northern BC survey stations out of frame).

3.5. Common Poorwill Range

Common Poorwills were detected in several new locations for the BC Nightjar Survey this season, including Princeton, Cranbrook, Ashcroft, Cache Creek, Lillooet, and Kamloops (Figure 5). Common Poorwills were detected in relatively high abundance in the south Okanagan, east of Kamloops, and near Lillooet. Surprisingly, no Common Poorwills were

detected in the north Okanagan around Kelowna in 2014, despite the completion of multiple survey routes in this area.

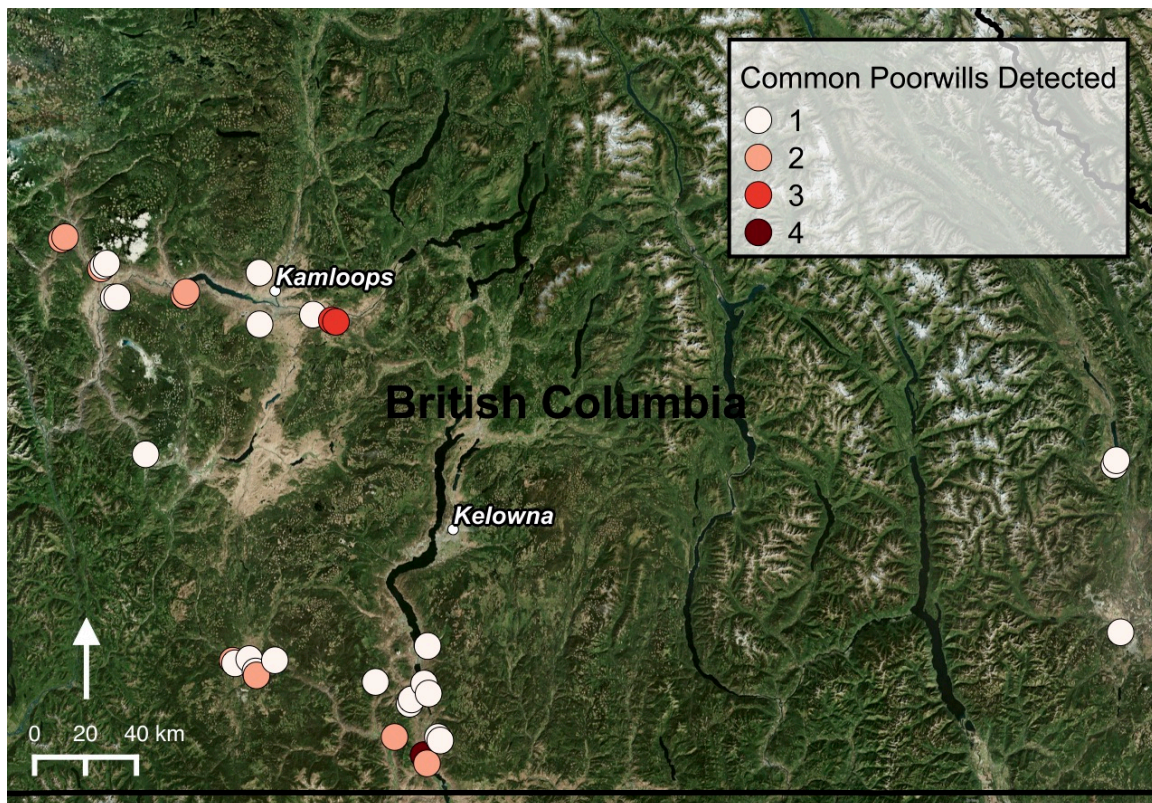


Figure 5. Abundance of Common Poorwills detected at survey stations during the BC Nightjar Survey in 2014.

3.6. Route Spotlight: Ashcroft

By Virginia Noble, 2014 WildResearch Biologist

It's hard to pick one favourite survey route or experience to talk about with regards to my travels in search for nightjars. Almost all the locations I surveyed I had never traveled to before and I had great moments, but Ashcroft was probably my favourite survey area. The Ashcroft route is located approximately 70 km west of Kamloops (Figure 5). In Ashcroft, I had the pleasure of having some company during my surveys from WildResearch President, Paul Levesque for a few days. It was nice being able to tag team some of the routes in the area and we were able to get twice as many routes completed as I could by myself. We had incredible luck with Common Poorwills and Common Nighthawks in almost every location in the area: Cache Creek, Savona, Ashcroft, and a couple of routes towards Lillooet.

In Ashcroft, I had the neatest interaction with a Common Poorwill, which was also the first Common Poorwill I had ever seen! With the full moon as my company, I had heard

Common Poorwills earlier during the second half of my survey. I was also conducting a third survey at each station using call playbacks to test whether Common Poorwill detectability depends on the presence of other Common Poorwills, which could make it harder to detect individuals in areas with few Common Poorwills. On previous surveys, I had not had much response to the playbacks. On this occasion, the playback seemed to have made the Common Poorwill I heard earlier stop calling, so I was a bit disappointed; however, by the last minute of my three-minute playback, something had swooped down near my head and tried to land on the car! The Common Poorwill then landed about 4 feet away from me and fluttered about while calling back to my playback speaker! It then proceeded to fly in circles above, calling frantically, clearly unappreciative of my fake Common Poorwill encroaching on his territory. I left quickly so that he could settle down and return to his regular schedule, but this was certainly one of the greatest highlights of my field session!

My experiences detecting abundant Common Poorwills and Common Nighthawks in the Ashcroft area were also significant because it taught me to identify suitable habitat for both species. In particular, I noted that rocky outcrops, sparse conifers, and ridges were consistent characteristics. Following are some pictures I took of habitat where I heard both species of nightjars (Figures 6 and 7).



Figure 6. From camp in Ashcroft, we heard Common Poorwills across and saw Common Nighthawks above the lake.



Figure 7. A location near camp in Ashcroft where Common Poorwills were calling from. Note: Rocky outcrops, sparse conifers, and elevated location.

3.7. Citizen Scientist Spotlight: Volunteering as a 1st Timer and Beginner Birder

By Alex Dalton, WildResearch Member and 2014 BC Nightjar Survey Citizen Scientist

This past summer, I had the opportunity to conduct five BC Nightjar Surveys near Oliver and Lillooet, and it was a wonderful experience. I have been volunteering with WildResearch for less than a year at the Iona Island Bird Observatory in Richmond, so it was neat to contribute to a different kind of bird survey. I am still a beginner birder, so when I attended the Two-Species Zone orientation in Oliver, it was the first time that I had ever heard a Common Poorwill! During the orientation, Virginia Noble led the surveyors who attended the orientation through the survey protocol and we also conducted a survey together as a group. It was great to be out with more advanced surveyors, as they verified that the calls I was hearing were indeed of Common Poorwill and they also taught me how to cup my hands around my ears to focus my hearing in a particular direction (so cool how we can focus our hearing!; Figure 8). This technique came in handy at one station where it helped us to identify that there were three different individual Common Poorwills calling. We unfortunately did not hear any Common Nighthawks during the orientation; however, armed with my own CD of birdcalls, I was pretty confident that I could identify both the call and wing-boom of the Common Nighthawk. Later in the season conducting surveys, I was able to identify both species of nightjars on my survey route.



Figure 8. Alex Dalton conducting a nightjar survey using his new ear cupping technique.

One of my favourite survey nights was when I was out on a more remote gravel road and came across a Common Poorwill sitting in the middle of the road (Figure 9)! It was amazing to see this elusive creature, which up until then I had only heard; it was like putting a face to a name.



Figure 9. Two photos of the Common Poorwill seen on the road.

Participating in the BC Nightjar Survey was a wonderful experience for me because it allowed me to undertake a scientific sampling method which I had never done before, allowed me to positively identify birds that I had never heard or seen before, and allowed me to contribute to the conservation of a species.

Are you a volunteer conducting BC Nightjar Surveys? Would you like to contribute a Citizen Scientist Spotlight to the 2015 Annual Report? Share your experiences and photos with us at nightjars@wildresearch.ca, even if you don't detect any nightjars!



Figure 10. A great picture of a Common Nighthawk submitted by one of our citizen scientists.

4. DETECTABILITY & PROTOCOL ASSESSMENT

4.1. Background

The 2014 amendments to the BC Nightjar Survey protocol included restricting the start time of surveys to 30 minutes before sunset, changing the times of year during which surveys could be conducted, and removing of the requirement to survey within 1 week of the full moon. In order to assess whether these recent protocol updates have improved the detectability (i.e., the probability that a bird that is present is detected during a survey) of Common Nighthawks and Common Poorwills, we conducted a preliminary detectability analysis of the 2014 BC Nightjar Survey data.

4.2. Statistical Methods

First, we compared the number of Common Nighthawks and Common Poorwills detected in the Two-Species Zone on the survey starting 30 minutes before sunset with the number detected on the survey starting 30 minutes after sunset using a paired t-test. Second, we combined the One-Species Zone and Two-Species Zone data to compare the number of individuals of each species detected per month of the survey (May, June, July) using a generalized linear model with a Poisson distribution. Third, we compared the number of individuals of both species detected when the moon was visible and when the moon was

not visible using a generalized linear model in order to assess the importance of moon presence on nightjar detectability. Finally, the influence of year was analyzed using a subset of eight routes surveyed in 2012 – 2014 using a linear mixed effects model with route as the random factor. Linear mixed effects models were then compared using a likelihood-ratio test.

4.3. Detectability Results

4.3.1. Time of Day

In the Two-Species Zone, more Common Nighthawks were detected during the survey that started 30 minutes before sunset than the survey that started 30 minutes after sunset ($t_{461} = 3.52$, $P < 0.001$; Figure 11). In contrast, more Common Poorwills were detected during the survey that started 30 minutes after sunset than the survey that started 30 minutes before sunset ($t_{473} = -4.54$, $P < 0.001$). These results confirm that modifying the survey protocol to target each species at a different time of day has resulted in increased detectability of each species.

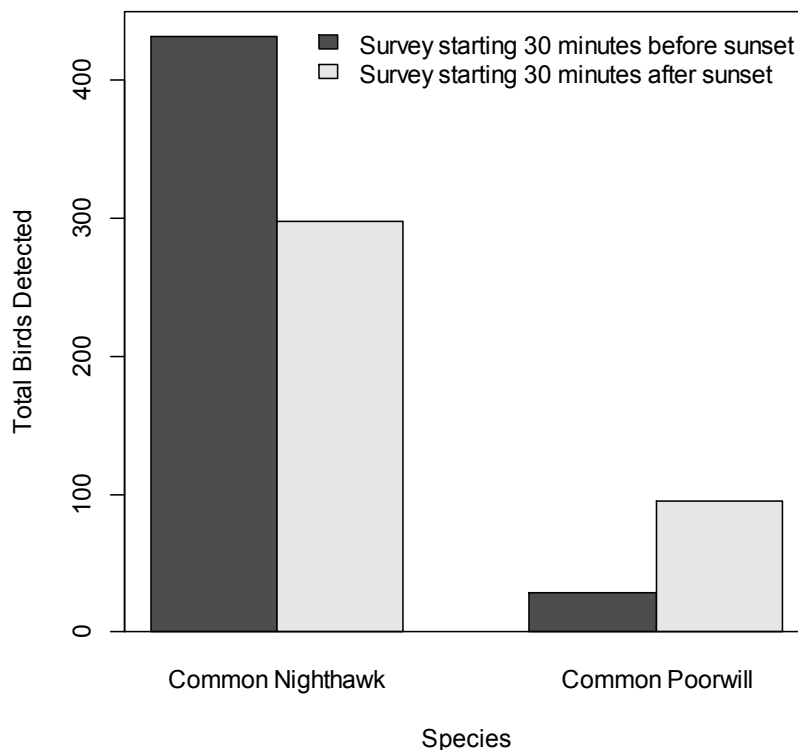


Figure 11. The number of nightjars detected in the Two-Species Zone during the survey starting 30 minutes before sunset and the survey starting 30 minutes after sunset.

4.3.2. Month

Overall, Common Nighthawk detection was significantly affected by month in 2014 ($z = 6.30$, $P < 0.001$), with more detections per route in June than in May or July (Figure 12). The

first Common Nighthawks that were detected were on May 30th and 31st. There were nine survey routes in the Two-Species Zone that were surveyed before May 30th, and so these routes may actually be suitable habitat and were surveyed too early. This flaw in survey timing will be addressed with a change to the Two-Species Zone protocol for 2015, either by requiring two surveys per route, or restricting the survey period to June. For Common Poorwills, there was no significant difference in the number of birds detected at each survey station between May and June ($z = -1.80$, $p = 0.07$).

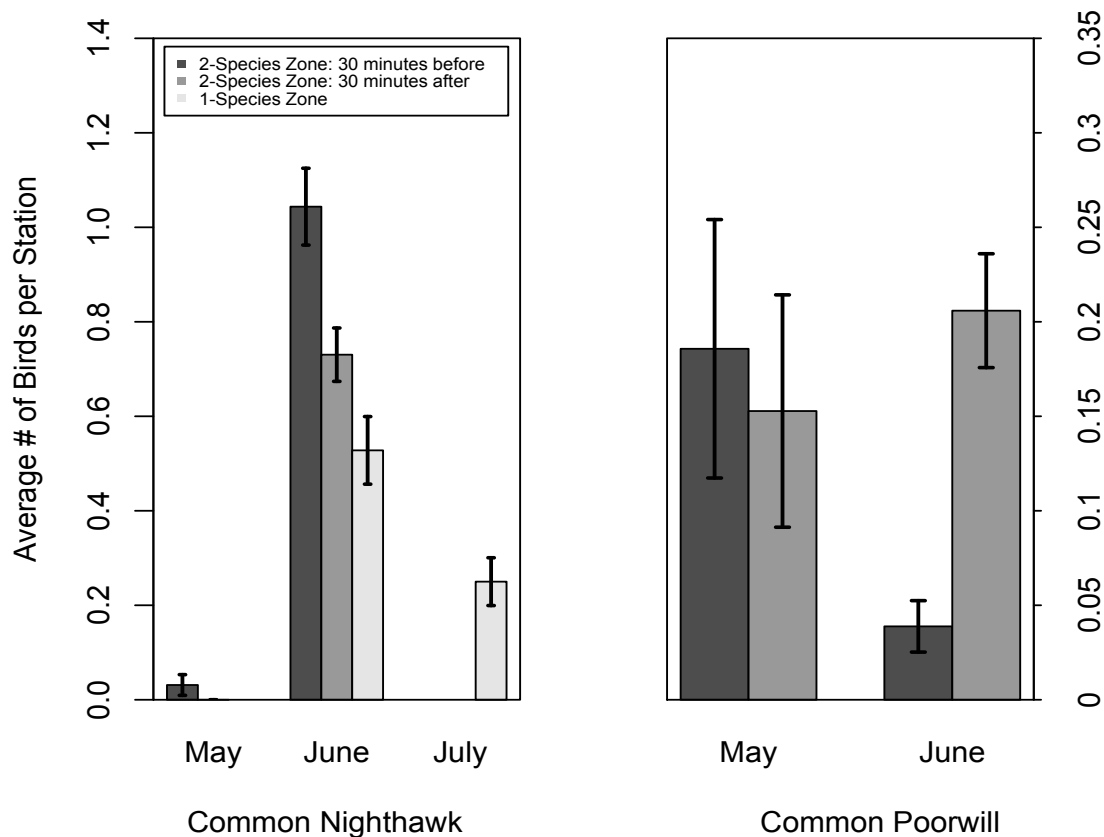


Figure 12. Average number of nightjars detected per survey station during the Two-Species Zone and the One-Species Zone in May, June and July (error bars represent standard error).

4.3.3. Moon

Overall, the average number of Common Nighthawks detected per route was not significantly affected by lunar presence when the two survey zones were combined ($z = -1.64$, $P = 0.10$; Figure 13). In contrast, more Common Poorwills were detected when there was a moon visible ($z = 2.38$, $P = 0.02$). Further analyses will be conducted to determine how much detectability is affected by the presence of the moon.

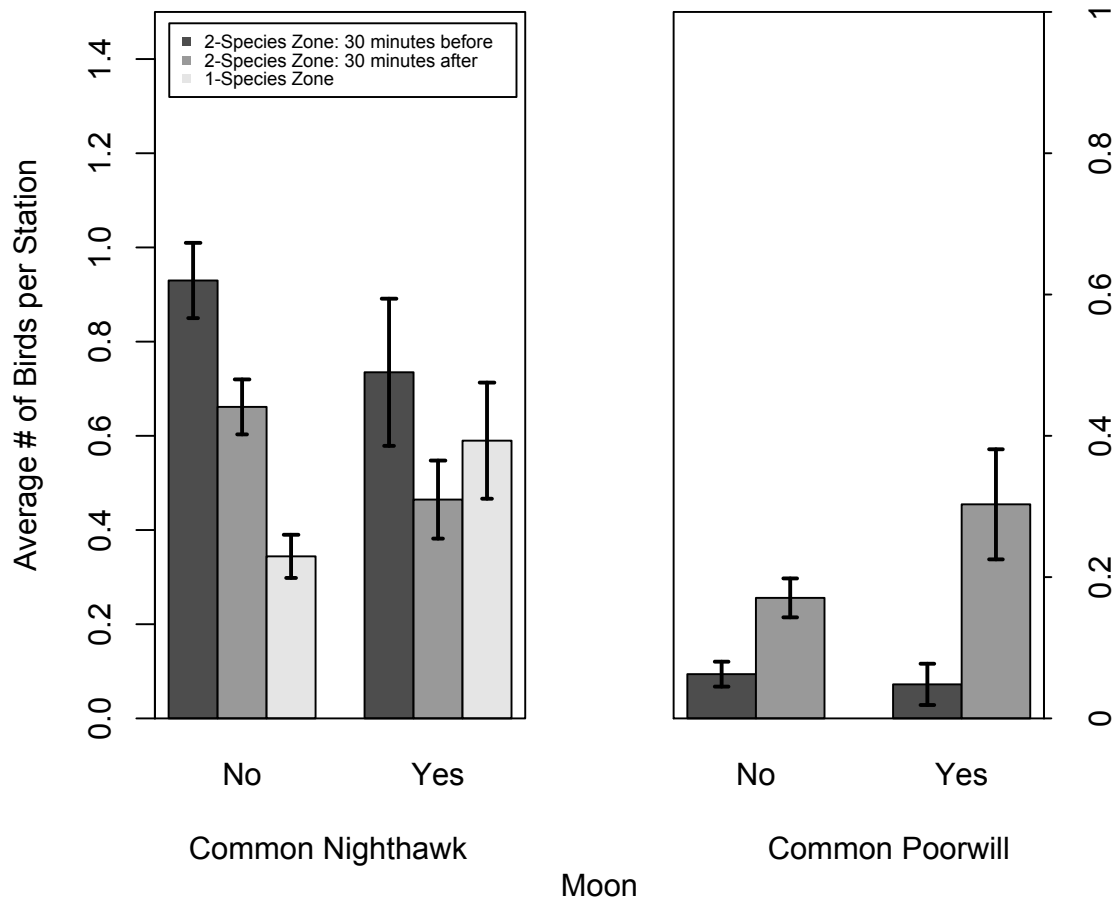


Figure 13. The average number of nightjars per station in the Two-Species Zone with and without a visible moon (error bars represent standard error).

4.3.4. Year

In the Two-Species Zone where we have been conducting surveys since 2010, there are eight routes that have been surveyed over consecutive years (Figure 13, Figure 14). When comparing the null model to the model that included year as a fixed factor, the model that included year as a factor was significantly better at explaining detectability in Common Poorwill (L ratio = 13.52, $P = 0.001$) and Common Nighthawk (L ratio = 34.22, $P < 0.0001$). In 2014, there were more Common Nighthawks detected than in previous years, which is likely due to the change in survey protocol in 2014 (Figure 14). In 2013 and 2014, there were less Common Poorwills detected compared to 2012 (Figure 15); however, the presence of Common Poorwills on the White Lake and Willowbrook routes has been consistent from 2012-2014.

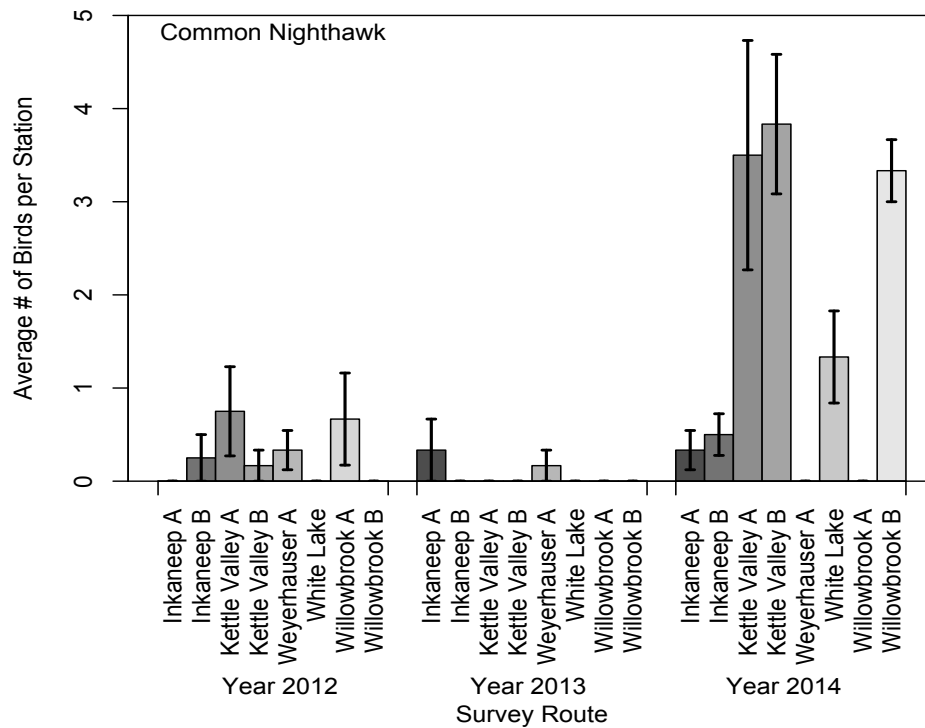


Figure 14. The average number of Common Nighthawks per survey route in 2012, 2013, and 2014 (error bars represent standard error).

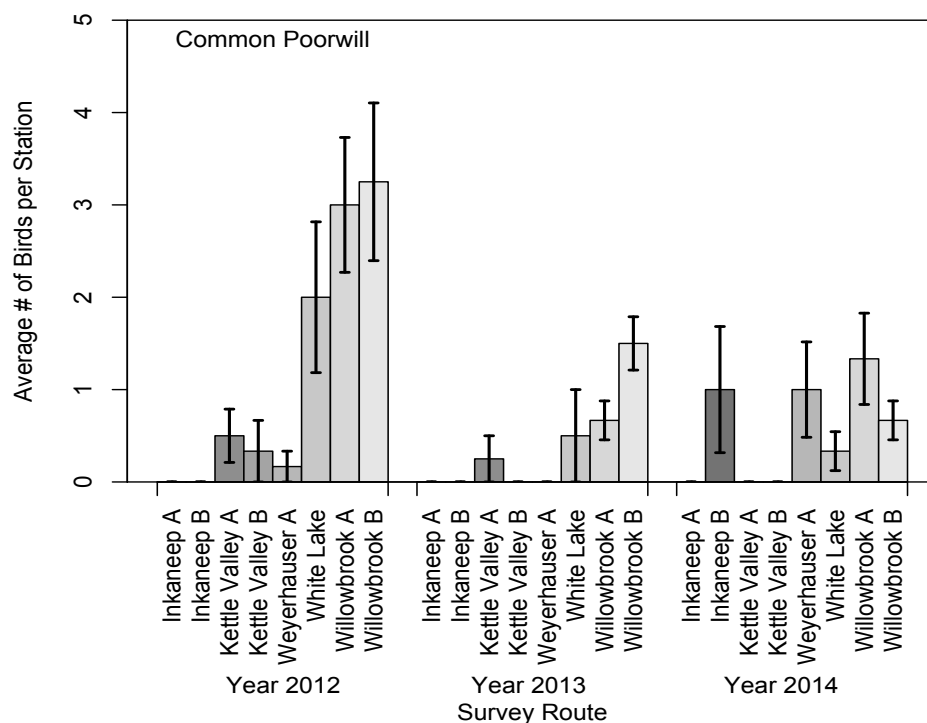


Figure 15. The average number of Common Poorwills per survey route in 2012, 2013, and 2014 (error bars represent standard error).

4.4. Conclusions

Preliminary detectability analyses suggest that some of the amendments made to the BC Nightjar Survey protocol in 2014 have increased nightjar detectability; however, other amendments require further analysis and revision. Changing the start time of the surveys to target Common Nighthawks starting at 30 minutes before sunrise has increased the detectability of this species, while continuing to survey at 30 minutes after sunrise for Common Poorwills will ensure both species are detected more often. The change in survey date in the Two-Species zone resulted in the absence of Common Nighthawks detected at routes surveyed in May, prior to the arrival of this species in BC. This change was made in 2014 in order to collect data on what the survey period should be for both nightjar species the Two-Species Zone, and will be addressed with an amendment to the protocol for 2015, either by requiring two surveys per route, or restricting the survey period to June. Finally, Removal of the lunar restriction (i.e., surveying only when the moon is visible above the horizon and within one week of full moon) may have slightly decreased the detectability of Common Poorwills. Further analysis on the magnitude of this decrease will help determine whether the protocol should be amended again, or whether the logistical benefits of removing the lunar cycle restriction outweigh the slight increase in Common Poorwill detectability when the moon is visible.

5. FUTURE DIRECTIONS

5.1. Plans for 2015

5.1.1. Streamlining

Our goal for the 2015 BC Nightjar Survey season is to continue to streamline the volunteer process for participating Citizen Scientists. We received valuable feedback from many 2014 volunteers, who told us that the data entry and waiver processes need improvement, and provided tips on how to improve the clarity of the protocols. In response, we are currently working towards:

- Building an online atlas for the BC Nightjar Survey with the Community Mapping Network that will allow for online data entry, and hope it will be ready for use in 2015!
- Researching online waiver forms to eliminate the cumbersome requirement to print, sign, scan, and email.
- Updating the protocol so that Common Nighthawks are adequately surveyed in the Two-Species Zone.
- Updating the protocol documents with a one-page summary and details on determining sunset time.

Thanks for your patience and feedback in 2014!

5.1.2. Community Building

We are working towards increasing the sense of community amongst our BC Nightjar Survey volunteers. Pending funding to hire a Coordinator in 2015, we will be hosting more survey orientations in different areas of the province. We will also be starting a bi-monthly BC Nightjar Newsletter to communicate program news with volunteers on a regular basis. If you have any suggestions for community building amongst BC Nightjar Survey volunteers, please get in touch at nightjars@wildresearch.ca!

5.1.3. Data Use

Coming soon, the BC Nightjar Survey data will be available on Bird Studies Canada's NatureCounts data portal. The NatureCounts portal will allow public access to the data so that the data freely collected by citizen scientists is also freely accessible.

5.1.4. In-depth Detectability Analysis

More formal detectability analyses including wind, car traffic, and noise will be conducted using Program MARK to ensure our protocols are optimized for future survey seasons.

5.2. Long-Term Plans

In the long-term, we will continue working towards the research objectives for both nightjar species. The data collected can also be used for the recovery of the Common Nighthawk and to facilitate and contribute to COSEWIC assessment of the Common Poorwill in Canada. As we collect more data and conduct formal statistical analyses, we plan to publish our findings in scientific journals to share our knowledge with other experts and the public. We will continue collaboration with the Canadian Wildlife Service, Nightjar Survey Network, and Bird Studies Canada and are pleased to announce a new collaborative relationship with the University of Alberta.

