



Bird Monitoring Study Data Report

January – February 2017

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Cloudbridge Nature Reserve

September 2017



Red Legged Honeycreeper (*Cyanerpes cyaneus*)



Green Crowned Brilliant (*Heliodoxa jacula*)



Black Guan (*Chamaepetes unicolor*)

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1 PROJECT BACKGROUND

A bird monitoring study was initiated at Cloudbridge Nature Reserve (Cloudbridge) in 2013 to monitor the diversity and presence of birds within the reserve, as well as build a bird species list for the reserve. The study has been conducted regularly between 2013 and the present, with some breaks in data collection of between a couple weeks to several months. Data was collected by research interns trained in Costa Rican bird identification prior to beginning data collection.

Data was collected by conducting point count surveys at set locations throughout the reserve. The survey methodologies and locations have changed slightly over the duration of the project. In the spring of 2016, the survey methodology and locations were standardized and a protocol prepared. This was done to ensure the methods will remain consistent in the future and that the survey locations were similar to those used for other monitoring studies in the reserve.

This data report has been prepared to summarize the data collected during the January – February 2017 period and does not present analysis or discussion of the results.

1.1 PROJECT GOALS

This study was set-up to accomplish two main goals:

1. Build and maintain a bird species list for Cloudbridge; and,
2. Assess differences in species composition and abundance between different successional habitat types, and monitor how that changes as the forest continues to regenerate.

Goal 1: Build and maintain a bird species list

To accomplish this goal, data from the point count surveys is combined with other bird observations from owl and breeding bird call-playback surveys, walking surveys, and incidental observations to update and maintain the Cloudbridge bird species list. The full bird species list can be found on the Species List page of the Cloudbridge website (Cloudbridge 2017).

Goal 2: Successional habitat bird study

This goal uses data collected from point count surveys to compare the differences in bird species composition and abundance between different successional habitat types throughout Cloudbridge. Bird point counts are surveyed regularly throughout the year in order to monitor seasonal changes in bird presence throughout the reserve and assess diversity and abundance in the different habitat types.

Successional habitat types include:

- 1) Planted areas (P),
- 2) Areas with both planted and naturally regenerated forest under 30 years old (P/NR<30),
- 3) Naturally regenerated areas under 30 years old (NR<30),
- 4) Naturally regenerated areas over 30 years old (NR>30),
- 5) Naturally regenerated areas with forest both under and over 30 years old (NR±30), and
- 6) Old growth forest (OG).

2 METHODS

2.1 TRAINING

All bird research interns are required to individually pass a test on visual bird identification prior to conducting point counts. The test consists of 30 images of birds on the current bird species list, with each image shown for 15 to 45 seconds. While the images are being shown, interns can take notes and have access to a bird ID book (Garrigues and Dean 2007). After all images are shown, interns are able to review their notes and work with a bird ID book to identify the birds. A passing grade is 28 out of 30. Interns can retake the test several times until a passing grade is reached.

2.2 SURVEY TIMING

During a survey period, all 5 survey groups shown in Table 1 are surveyed once per week. Point counts are conducted during the day, starting at approximately 6 am and are completed by 10 am at the latest.

The order in which the stations in each group are surveyed is varied between sampling events in order to ensure variation in survey results is not due to the time of day the sites were sampled. For example, if one week the El Jilguero group is surveyed in the following order: 30, 27, 28, 33, and 12; the next time it is sampled, it is surveyed in the other direction: 12, 33, 28, 27, and 30.

From October 2016, walking surveys were completed in conjunction with point count surveys. In the October to December 2016 period, each walking survey route is completed once in a 2 week period, scheduled every two days. For the January to February 2017 period, walking surveys were completed more infrequently. The research interns were also conducting data collection for another project and had to split their time between the walking surveys and the other project.

The first scheduled point count starts at, or after, 6:00 am, with the walking survey starting either before or immediately after the point count is complete. When the next bird station is reached, the point count is completed as usual. The last point count on the route is completed by 10:00 am at the latest, and the walking survey continues until around 12:00 pm.

A total of 7 point count surveys were conducted for each group of stations, except for the El Jilguero group which was only surveyed 6 times, for a total of 156 surveys in the January and February, 2017 period (Table 2). The number of surveys conducted in each habitat type is shown in Table 3.

TABLE 1: Summary Information on Current Bird Stations – March 2016 to Present

| Survey Group | Bird Station | Habitat Type | Trail | Elevation (m) | Date First Surveyed | Latitude ¹ | Longitude ¹ |
|------------------|--------------|--------------|-------------|---------------|---------------------|-----------------------|------------------------|
| Montaña/Chirripó | 1 | P | Montaña | 1730 | 25-Feb-2013 | 9.473409 | -83.568988 |
| | 3 | P | Montaña | 1830 | 7-Feb-2013 | 9.471708 | -83.568038 |
| | 5 | NR<30 | Montaña | 1970 | 25-Feb-2013 | 9.469800 | -83.565784 |
| | 7 | NR<30 | Montaña | 2070 | 25-Feb-2013 | 9.467209 | -83.565401 |
| | 9 | OG | Chirripó | 2140 | 7-Nov-2013 | 9.464493 | -83.564908 |
| Sentinel/Gavilan | 34 | OG | Gavilan | 1950 | 22-Feb-2013 | 9.467410 | -83.571020 |
| | 14 | NR>30 | Gavilan | 1875 | 22-Feb-2013 | 9.468808 | -83.571684 |
| | 15 | P | Gavilan | 1805 | 22-Feb-2013 | 9.470275 | -83.572487 |
| | 16 | P/NR<30 | Gavilan | 1735 | 22-Feb-2013 | 9.471758 | -83.572306 |
| | 32 | P | Sentinel | 1725 | 16-Aug-2013 | 9.472040 | -83.571150 |
| Principal/Rio | 31 | NR<30 | Principal | 1625 | 16-Aug-2013 | 9.472500 | -83.574651 |
| | 17 | NR<30 | Rio | 1660 | 24-Jul-2013 | 9.473032 | -83.572289 |
| | 18 | P/NR<30 | Rio | 1650 | 28-Feb-2013 | 9.473445 | -83.571454 |
| | 19 | NR<30 | Rio | 1665 | 24-Jul-2013 | 9.474947 | -83.569900 |
| | 20 | P/NR<30 | Rio | 1710 | 28-Feb-2013 | 9.474391 | -83.568103 |
| Don Victor | 22 | NR<30 | Don Victor | 1810 | 26-Feb-2013 | 9.482593 | -83.567272 |
| | 24 | NR<30 | Don Victor | 1795 | 26-Feb-2013 | 9.480980 | -83.567934 |
| | 25 | NR<30 | Don Victor | 1770 | 6-Feb-2013 | 9.479409 | -83.567758 |
| | 26 | NR<30 | Don Victor | 1745 | 6-Feb-2013 | 9.477481 | -83.568253 |
| El Jilguero | 30 | P | El Jilguero | 1640 | 2-Aug-2013 | 9.469620 | -83.578210 |
| | 27 | P | El Jilguero | 1650 | 26-Jul-2013 | 9.470344 | -83.577857 |
| | 28 | NR<30 | El Jilguero | 1760 | 26-Jul-2013 | 9.468912 | -83.575908 |
| | 33 | NR±30 | El Jilguero | 1845 | 15-Mar-2016 | 9.467910 | -83.574070 |
| | 12 | OG | El Jilguero | 1965 | 22-Feb-2013 | 9.466300 | -83.571240 |

P = Planted, NR<30 = Natural Regeneration Under 30 Years, NR>30 = Natural Regeneration Over 30 Years, NR±30 = Natural Regeneration Over and Under 30 Years, P/NR<30 = Planted and Natural Regeneration Under 30 Years, OG = Old Growth.

¹, WGS84

TABLE 2: Number of Point Counts Per Month

| Month | Station* | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
| Jan | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 78 |
| Feb | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 78 |
| Total | 7 | 7 | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 7 | 7 | 6 | 7 | 156 |

*, Station 20 was accidentally left out of the surveys during this survey period.

TABLE 3: Number of Point Counts Per Habitat Type

| Month | Habitat | | | | | | Total |
|---------------|---------|---------|-------|-------|-------|----|-------|
| | P | P/NR<30 | NR<30 | NR>30 | NR±30 | OG | |
| Jan | 20 | 6 | 36 | 3 | 3 | 10 | 78 |
| Feb | 20 | 8 | 33 | 4 | 3 | 10 | 78 |
| Total | 40 | 14 | 69 | 7 | 6 | 20 | 156 |
| # of Stations | 6 | 2 | 10 | 1 | 1 | 3 | 23 |

P = Planted, NR<30 = Natural Regeneration Under 30 Years, NR>30 = Natural Regeneration Over 30 Years, NR±30 = Natural Regeneration Over and Under 30 Years, P/NR<30 = Planted and Natural Regeneration Under 30 Years, OG = Old Growth.

2.3 POINT COUNTS

2.3.1 LOCATIONS

Since the beginning of the study, survey locations have been added and dropped from the study. As a result, the station numbers currently in use are often not sequential and several numbers are not in use. The survey locations have remained stable since March 2016, and will remain so going forward.

Since March 2016, 24 bird stations are surveyed as part of the point count study (Figure 2). Stations are marked with a small metal sign (Figure 1), which serves as the centre of the survey area (see Section 2.3.2). Stations are surveyed in groups of 5 per survey day, with one group containing only 4 stations. Summary information on each station is provided in Table 1 by survey group.

In the current period, Station 20 on the Rio trail was not surveyed; the station was left out in error. As such, only 23 stations were surveyed.



FIGURE 1: Example of a bird station marker.



FIGURE 2: Locations of point count stations, March 2016 to present.

2.3.2 PROCEDURE

Prior to beginning of each point count, the rain, wind, and cloud cover are recorded according to the classes presented in Tables 4-6. The start time is recorded and all birds seen or heard within or outside the survey area within the following 20 minutes are recorded. Garrigues and Dean (2007) is used as the main reference for bird identification and the Neotropical Birds website (CLO 2017) is used to check current species names and classifications. The method of identification (visual, audio or audio/visual), and whether the bird was inside or outside of the survey area is also recorded. If birds cannot be identified to species, they are still recorded to the lowest identifiable taxon (ex. hummingbird, flycatcher, *Contopus sp.*, etc.) in order to record an accurate measure of overall abundance at the site. Within the 20 minutes, the presence of individual birds is broken into 5 different intervals: 0-2 mins, 2-5 mins, 5-10 mins, 10-15 mins, and 15-20 mins. This is done to allow the data to be comparable with other bird studies conducted with different survey durations. For example, a bird seen in the survey area from minute 9 of the survey to minute 16, would be recorded as present in the 5-10 minute, 10-15 minute, and the 15-20 minute intervals.

The survey area includes the area within a 25 m radius of the bird point count marker (measured horizontally out from the point), extending in a cylinder from the ground to the top of the canopy (Figure 3). Birds seen or heard outside of that cylinder, or which pass through but do not utilize the habitat, are recorded as ‘outside’. Birds passing through the area that do utilize the habitat (ex. catching bugs in flight, resting on vegetation), are recorded as inside (Figure 4).

In addition to the species or lowest identifiable taxonomic group of each bird, the following information is recorded whenever possible:

- Sex (male, female, or unknown),
- Age class (Table 7),
- Breeding status (Table 8), and
- Nesting behaviour (Table 9).

TABLE 4: Rain Class

| Rain Class | | Conditions |
|------------|----------|---|
| 0 | None | No rain. |
| 1 | Drizzle | Barely raining. Tiny raindrops, very sparse or erratic rainfall. Rain gear not necessary. |
| 2 | Light | Rain falling at a steady rate, but sparse. Would get soaked if out for an extended period without rain gear. |
| 3 | Moderate | Rain constant and dense. Would get soaked in minutes without rain gear. |
| 4 | Heavy | Raindrops large and falling with force. Streams forming on some trails. Would get soaked immediately without rain gear. |
| 5 | Severe | Storm conditions. Sheets of rain falling from the sky. Trails become creeks. Dangerous to be out at all. |

TABLE 5: Wind Class

| Wind Class | | Conditions |
|------------|----------|--|
| 0 | Calm | Calm. Smoke rises vertically. |
| 1 | Faint | Fog and smoke drift indicates wind direction. Leaves stationary. |
| 2 | Light | Wind felt on exposed skin. Leaves rustle. |
| 3 | Moderate | Leaves and small twigs constantly moving. Light flags extended. |
| | | Dust and loose paper raised. Small branches begin to move. |
| 4 | Strong | Branches of a moderate size move. Small trees in leaf begin to sway. |
| | | Large branches in motion. Umbrella use becomes difficult. Empty plastic bins tip over. |
| 5 | Severe | Whole trees in motion. Effort needed to walk against the wind. |

TABLE 6: Cloud Cover Class

| Cloud Class | | Conditions |
|-------------|---------------|--|
| 0 | Clear | No clouds. |
| 1 | Mostly Clear | A few scattered clouds. |
| 2 | Partly Cloudy | An equal amount of clouds and clear sky. |
| 3 | Mostly Cloudy | More clouds than clear sky. |
| 4 | Overcast | Full cloud cover. |
| 5 | Misty | Low lying clouds (fog). |

TABLE 7: Bird Age Class

| Age Class | | Description |
|-----------|-----------|---|
| A | Adult | Bird displaying adult plumage. |
| J | Juvenile | Bird displaying juvenile plumage. |
| F | Fledgling | Juvenile bird that has left the nest, but is still being fed by adults. |
| C | Chick | Juvenile bird still in the nest. |

TABLE 8: Bird Breeding Status

| Breeding Status | | Description |
|-----------------|--------------|--|
| B | Breeding | Bird displaying breeding plumage, or displaying breeding behaviours (i.e. nesting, mating, caring for chicks, etc.). |
| NB | Non-Breeding | Bird of a species with distinct breeding and non-breeding plumage displaying non-breeding plumage. |
| U | Unknown | Bird of a species without distinct breeding plumage not observed displaying breeding behaviours. |

TABLE 9: Bird Nesting Behaviour

| Nesting Behaviour | | Description |
|-------------------|-----------------|---|
| M | Mating | Adult bird observed actively mating. |
| NB-1 | Nest Building-1 | Adult bird observed carrying nest building materials in the beak or feet. |
| NB-2 | Nest Building-2 | Adult bird observed actively building a nest. |
| B | Brooding | Adult bird observed sitting on eggs. |
| F | Feeding | Adult bird observed feeding chicks, or interacting with chicks in the nest. |

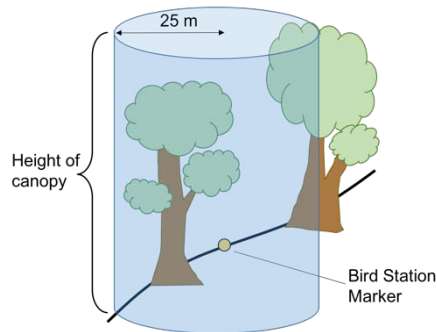


FIGURE 3: Point Count Survey Area

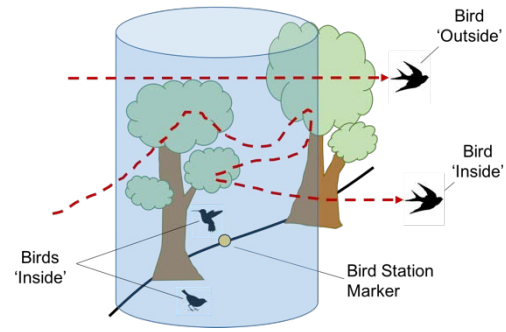


FIGURE 4: Inside vs Outside of Survey Area

2.3.4 DATA ANALYSIS

2.3.4.1 ABUNDANCE

When summarizing abundance data, only birds that were visually identified inside the survey area were counted. This is done to make the data comparable between stations and habitats. As bird research interns are not trained in audio identification, it is typically only the birds with the most distinctive calls that are identified by call, and others are challenging to identify correctly. Therefore, audio identifications provide supplementary information on the birds present in the reserve, but result in biases if included in comparisons between stations, and so are excluded. Similarly, birds seen outside the survey areas provide supplementary data, but cannot be used for comparisons between stations.

As there were unequal numbers of point counts conducted during this survey period, the average number of birds per point count was calculated to allow more accurate comparison between both stations and habitats.

In order to capture the full abundance when birds were not identified to species level, family level abundance was also calculated in addition to species level abundance.

2.3.4.2 RICHNESS

All species identified during point counts and walking surveys in the January and February 2017 period were summarized to assess general species presence. For comparisons between stations and sites, only the birds identified visually during point counts within the survey area were counted. Richness was also calculated at the family level to capture groups that were not identified to species level. Species richness was also reported, with non-species level taxa removed from the data set.

As there were unequal numbers of point counts conducted during this survey period, the average number of species per point count was calculated to allow more accurate comparison between both stations and habitats.

2.3.4.3 DIVERSITY

Simpson's Index of Diversity (SID) was calculated to compare the diversity between sites. SID is a measure of the likelihood that two individuals drawn at random from a population will be from the same species. The index ranges between 0 and 1, with 0 representing no diversity all 1 equaling high diversity. The index uses the following formula:

$$\text{Simpson's Index of Diversity} = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

It should be noted that abundances were not adjusted for differences in sample sizes. As such the diversity numbers are not directly comparable between stations or habitats.

2.4 WALKING SURVEYS

Walking surveys consist of walking slowly along the trails of the reserve and recording every bird seen or heard. These are done to survey bird presence within the entire reserve that may not be captured at the point counts, and potentially record rare or uncommon birds. The methodology for the walking surveys is still evolving. Starting in October 2016, walking surveys were done in conjunction with the point count surveys rather than on separate days.

2.4.1 LOCATIONS

Walking survey locations depend on which bird point counts are being surveyed (and in which order) on a walking survey day. Suggested routes were used for walking surveys in the October to December 2016 period and in subsequent periods, but were not followed during the January to February 2017 period. Research interns during this period split their time between walking surveys and data collection for another project. As a result, only 5 walking surveys were conducted, on the trails listed in Table 10.

TABLE 10: Trails Where Walking Surveys Were Conducted – January-February 2017

| Trail | Number of Days Surveyed |
|-------------|-------------------------|
| Don Victor | 2 |
| El Jilguero | 1 |
| Gavilan | 2 |
| Montaña | 1 |
| Principal | 3 |
| Rio | 1 |
| Sentinel | 3 |
| Base | 1 |

2.4.1.1 DATA COLLECTION

Prior to beginning the survey, the following information is recorded: date, start time, general weather conditions (Tables 4-6), and survey route. During the walking survey, any bird seen or heard is recorded (to the lowest possible taxon) and then a tally kept of the number of each identified. At the end of the walking survey, the end time, and general weather conditions is recorded. If major changes in weather occurred during the survey, these are also recorded.

Data collected from walking surveys is uploaded to eBird (www.ebird.org), a citizen science bird database run by Cornell Lab of Ornithology, as well as recorded in an excel database.

2.4.1.2 DATA ANALYSIS

Walking survey data is only used to create a species list for the reserve during the survey period as well as to add to the Cloudbridge bird species list.

3 DATA SUMMARY

3.1 SPECIES IDENTIFIED

Overall, 72 unique bird species were identified during point count and walking surveys in the January/February 2017 period (Table 11). Point counts found 64 species, 56 of which were identified visually, within the survey area, meaning they can be used for future analysis and comparison between sites. Species only identified by audio means or those that were only identified outside of the survey area are used to build the species list, but will not be used for analysis. Three (3) species were identified only by their song inside the survey area: Lesser Violetear (*Colibri cyanotus*), Resplendent Quetzal (*Pharomachrus mocinno*), and Great Kiskadee (*Pitangus sulphuratus*). There were also 5 species only identified outside of the survey area during point counts: Band-tailed Pigeon (*Patagioenas fasciata*), Gartered Trogon (*Trogon caligatus*), Blue-and-white Swallow (*Pygochelidon cyanoleuca*), Black-throated Green Warbler (*Setophaga virens*), and Golden-crowned Warbler (*Basileuterus culicivorus*).

Walking surveys found 37 species. Of those, 8 were only identified during walking surveys and not during point counts (Table 11).

3.1.1 THREATENED SPECIES

Three (3) species on the IUCN Redlist of Threatened Species (www.iucnredlist.org) were identified during the survey period (Table 11). Of these, 1 species is considered Vulnerable (VU): Ruddy Pigeon (*Patagioenas subvinacea*). The other 2 are considered Near Threatened (NT): Black Guan (*Chamaepetes unicolor*) and Resplendent Quetzal (*Pharomachrus mocinno*).

TABLE 11: Bird Species Identified, All Methods

| English Name | Scientific Name | IUCN Status ¹ | Point Counts | | | Walking Surveys | |
|--------------------------------|-----------------------------------|--------------------------|------------------------|----------------------------|-----------------------|------------------|----------------------|
| | | | IN Visual ² | IN Audio Only ³ | OUT Only ⁴ | All ⁵ | WS Only ⁶ |
| Cracidae | | | | | | | |
| Black Guan | <i>Chamaepetes unicolor</i> | NT | x | | | | |
| Odontophoridae | | | | | | | |
| Spotted Wood-Quail | <i>Odontophorus guttatus</i> | LC | x | | | x | |
| Apodidae | | | | | | | |
| Vaux's Swift | <i>Chaetura vanxi</i> | LC | | | | x | x |
| White-collared Swift | <i>Streptoprocne zonaris</i> | LC | x | | | | |
| Trochilidae | | | | | | | |
| Green Hermit | <i>Phaethornis guy</i> | LC | x | | | | |
| Lesser Violetear | <i>Colibri cyanotus</i> | LC | | x | | x | |
| Magenta-throated Woodstar | <i>Calliphlox bryantae</i> | LC | x | | | | |
| Purple-crowned Fairy | <i>Heliothryx barroti</i> | LC | x | | | | |
| Purple-throated Mountain-Gem | <i>Lampornis calolaemus</i> | LC | x | | | | |
| Rufous-tailed Hummingbird | <i>Amazillia tzacatl</i> | LC | x | | | | |
| Scintillant Hummingbird | <i>Selasphorus scintilla</i> | LC | x | | | | |
| Stripe-tailed Hummingbird | <i>Eupherusa eximia</i> | LC | x | | | x | |
| Violet Sabrewing | <i>Campylopterus hemileucurus</i> | LC | x | | | | |
| White-throated Mountain-gem | <i>Lampornis castaneiventris</i> | LC | x | | | | |
| Columbidae | | | | | | | |
| Band-tailed Pigeon | <i>Patagioenas fasciata</i> | LC | | | x | | |
| Chiriqui Quail-dove | <i>Zentrygon chiriquensis</i> | LC | | | | x | x |
| Ruddy Pigeon | <i>Patagioenas subvinacea</i> | VU | x | | | x | |
| Psittacidae | | | | | | | |
| Sulphur-winged Parakeet | <i>Pyrrhura hoffmanni</i> | LC | x | | | | |
| Cuculidae | | | | | | | |
| Squirrel Cuckoo | <i>Piaya cayana</i> | LC | x | | | x | |
| Trogonidae | | | | | | | |
| Collared Trogon | <i>Trogon collaris</i> | LC | x | | | | |
| Gartered Trogon | <i>Trogon caligatus</i> | LC | | | x | | |
| Resplendent Quetzal | <i>Pharomacrus mocinno</i> | NT | | x | | | |
| Momotidae | | | | | | | |
| Lesson's Motmot | <i>Momotus lessonii</i> | LC | x | | | | |
| Capitonidae | | | | | | | |
| Red-headed Barbet | <i>Eubucco bourcierri</i> | LC | x | | | | |
| Ramphastidae | | | | | | | |
| Northern Emerald-Toucanet | <i>Aulacorhynchus prasinus</i> | LC | x | | | x | |
| Picidae | | | | | | | |
| Rufous-winged Woodpecker | <i>Piculus simplex</i> | LC | | | | x | x |
| Furnariidae | | | | | | | |
| Plain Xenops | <i>Xenops minutus</i> | LC | | | | x | x |
| Scaly-throated Foliage-gleaner | <i>Anabacerthia variegaticeps</i> | LC | x | | | | |
| Spot-crowned Woodcreeper | <i>Lepidocolaptes affinis</i> | LC | x | | | | |
| Streak-breasted Treehunter | <i>Thripadectes rufobrunneus</i> | LC | | | | x | x |
| Rhinocryptidae | | | | | | | |
| Silvery-fronted Tapaculo | <i>Scytalopus argentifrons</i> | LC | x | | | | |
| Tyrannidae | | | | | | | |
| Black Phoebe | <i>Sayornis nigricans</i> | LC | x | | | x | |
| Bright-rumped Attila | <i>Attila spadiceus</i> | LC | | | | x | x |
| Dusky-capped Flycatcher | <i>Myiarchus tuberculifer</i> | LC | x | | | | |
| Golden-bellied Flycatcher | <i>Myiodynastes hemichrysus</i> | LC | x | | | | |
| Great Kiskadee | <i>Pitangus sulphuratus</i> | LC | | x | | x | |
| Least Flycatcher | <i>Empidonax minimus</i> | LC | x | | | | |
| Yellowish Flycatcher | <i>Empidonax flavescens</i> | LC | x | | | | |

| English Name | Scientific Name | IUCN Status ¹ | Point Counts | | | Walking Surveys | |
|---------------------------------|---------------------------|--------------------------|------------------------|----------------------------|-----------------------|------------------|----------------------|
| | | | IN Visual ² | IN Audio Only ³ | OUT Only ⁴ | All ⁵ | WS Only ⁶ |
| Tityridae | | | | | | | |
| Masked Tityra | Tityra semifasciata | LC | x | | | | |
| Hirundinidae | | | | | | | |
| Blue-and-white Swallow | Pygochelidon cyanoleuca | LC | | | x | x | |
| Turdidae | | | | | | | |
| Black-billed Nightingale-Thrush | Catharus gracilirostris | LC | x | | | | |
| Black-faced Solitaire | Myadestes melanops | LC | x | | | x | |
| Mountain Thrush | Turdus plebejus | LC | x | | | | |
| Troglodytidae | | | | | | | |
| Gray-breasted Wood-Wren | Henicorbhina leucophrys | LC | x | | | | |
| Rufous-breasted Wren | Pheugopedius rutilus | LC | x | | | x | |
| Vireonidae | | | | | | | |
| Philadelphia Vireo | Vireo philadelphicus | LC | x | | | | |
| Parulidae | | | | | | | |
| Black-and-white Warbler | Mniotilta varia | LC | x | | | | |
| Black-throated Green Warbler | Setophaga virens | LC | | | x | | |
| Blackburnian Warbler | Setophaga fusca | LC | x | | | | |
| Collared Redstart | Myioborus torquatus | LC | x | | | | |
| Costa Rican Warbler | Basileuterus melanotis | LC | x | | | | |
| Flame-throated Warbler | Oreothlypis gutturalis | LC | x | | | | |
| Golden-crowned Warbler | Basileuterus culicivorus | LC | | | x | | |
| Slate-throated Redstart | Myioborus miniatus | LC | x | | | x | |
| Tennessee Warbler | Oreothlypis peregrina | LC | x | | | x | |
| Tropical Parula | Setophaga pitiayumi | LC | x | | | | |
| Wilson's Warbler | Cardellina pusilla | LC | x | | | | |
| Worm-eating Warbler | Helmitberos vermivorum | LC | x | | | x | |
| Thraupidae | | | | | | | |
| Bay-headed Tanager | Tangara gyrola | LC | x | | | x | |
| Blue Dacnis | Dacnis cayana | LC | x | | | | |
| Buff-throated Saltator | Saltator maximus | LC | | | | x | x |
| Golden-hooded Tanager | Tangara larvata | LC | x | | | | |
| Scarlet-thighed Dacnis | Dacnis venusta | LC | x | | | | |
| Silver-throated Tanager | Tangara icterocephala | LC | x | | | x | |
| Yellow-faced Grassquit | Tiaris olivacea | LC | x | | | | |
| Emberizidae | | | | | | | |
| Chestnut-capped Brush-Finch | Arremon brunneinucha | LC | x | | | x | |
| Common Chlorospingus | Chlorospingus flavopectus | LC | x | | | x | |
| Sooty-capped Chlorospingus | Chlorospingus pileatus | LC | | | | x | x |
| Yellow-thighed Finch | Pselliophorus tibialis | LC | x | | | x | |
| Cardinalidae | | | | | | | |
| Black-thighed Grosbeak | Pheucticus tibialis | LC | x | | | x | |
| Flame-colored Tanager | Piranga bidentata | LC | x | | | x | |
| White-winged Tanager | Piranga leucoptera | LC | x | | | | |
| Total Species | | | 56 | 3 | 5 | 29 | 8 |

1, IUCN Redlist List of Threatened Species (www.iucnredlist.org). LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, NA = Not Assessed, DD = Data Deficient; 2, Bird species identified visually during point counts inside the survey area; 3, Bird species only identified by their call during point counts inside the survey area; 4, Bird species only identified outside of the survey area during point counts; 5, All bird species identified during walking surveys; 6, Bird species only identified during walking surveys and not during point counts.

3.3 ABUNDANCE

Overall, 337 birds were identified visually, inside the survey area during point counts in January and February 2018 at an overall rate of 2.2/PC (birds/point count), 2.0/PC in January and 2.3/PC in February (Table 12). The stations with the highest overall abundance were 28 (5.5/PC), 14 (4.4/PC), and 17 (4.0/PC). The stations with the lowest abundance were 19 (1.1/PC) and 12 (1.2/PC) with 5 others at 1.3/PC. In January, the stations with the highest abundance were 28 (7.0/PC), 17 (5.3/PC), and 14 (3.7/PC), while the lowest abundance was found at 27 (0.0/PC), 33 (0.3/PC), and 25 (0.8/PC). In February, the stations with the highest abundance were 14 (5.0/PC), 1 (4.3/PC), and 16 (4.0/PC), while the lowest abundance was found at 24 (0.3/PC), 22 (0.7/PC), and 18 and 19 (1.3/PC).

The habitat type with the highest abundance was NR>30, overall (4.4/PC) as well as in January (3.7/PC) and February (5.0/PC). The habitat with the lowest abundance was NR±30, overall (1.3/PC) and in January (0.3/PC) (Table 13). In February, OG had the lowest abundance (1.5/PC).

Overall in January/February, New World Sparrows & Allies (*Emberizidae spp.*) and New World Warblers (*Parulidae spp.*) were the most abundant families (4.55/10 PC), with Hummingbirds (*Trochilidae spp.*) the second most abundant (2.95/10 PC) (Table 15). The most abundant families at each station are highlighted in Table 15, with the most abundant family in red text and the 2nd most abundant in blue text. New World Warblers were the most abundant in 4 of the habitats (P, P/NR<30, NR>30, and NR±30), and 2nd most abundant in NR<30 and OG (Table 16). New World Sparrows were the most abundant in NR<30 and OG. Hummingbirds tied for highest abundance in OG, and 2nd most abundant in P/NR<30. Toucans (*Ramphastidae sp.*) were second most abundant in NR>30.

Overall, the five most abundant species in January and February, 2017 were: Common Chlorospingus (*Chlorospingus flavopectus*) (2.76/10 PC), Slate-throated Redstart (*Myioborus miniatus*) (2.18/10 PC), Northern Emerald-Toucanet (*Aulacorhynchus prasinus*) (1.35/10 PC), Yellow-thighed Finch (*Pselliophorus tibialis*) (1.03/10 PC), and Tennessee Warbler (*Oreothlypis peregrina*) (0.83/10 PC) (Table 15). The two most abundant species at each station are highlighted in Table 15, with the most abundant species highlighted in red and the 2nd most abundant highlighted in blue. Raw abundance of species across the stations is presented in Table 14.

Common Chlorospingus was the most abundant species in 3 of the 6 habitat types (P, P/NR<30, NR<30) and 2nd most abundant in OG (Table 16). Slate-throated Redstart was 2nd most abundant in 3 habitat types (P, P/NR<30, and NR>30), and most abundant in NR±30. In NR<30, unidentified hummingbird species were the 2nd most abundant. In P/NR<30, NR>30, NR±30 and OG, several species or species groups were 2nd most abundant, including: Tennessee Warbler (P/NR<30), Northern Emerald-Toucanet (P/NR<30), Chestnut-capped Brush-finch (*Arremon brunneinucha*) (NR>30), and Yellow-thighed Finch (OG).

TABLE 12: Bird Abundance By Station

| Station | January | | February | | Total | | # Point Counts |
|----------------|---------|----------|----------|----------|-------|----------|----------------|
| | Count | Birds/PC | Count | Birds/PC | Count | Birds/PC | |
| 1 | 5 | 1.3 | 13 | 4.3 | 18 | 2.6 | 7 |
| 3 | 5 | 1.3 | 5 | 1.7 | 10 | 1.4 | 7 |
| 5 | 8 | 2.0 | 6 | 2.0 | 14 | 2.0 | 7 |
| 7 | 5 | 1.3 | 4 | 1.3 | 9 | 1.3 | 7 |
| 9 | 10 | 2.5 | 7 | 2.3 | 17 | 2.4 | 7 |
| 12 | 5 | 1.7 | 2 | 0.7 | 7 | 1.2 | 6 |
| 14 | 11 | 3.7 | 20 | 5.0 | 31 | 4.4 | 7 |
| 15 | 7 | 2.3 | 13 | 3.3 | 20 | 2.9 | 7 |
| 16 | 6 | 2.0 | 16 | 4.0 | 22 | 3.1 | 7 |
| 17 | 16 | 5.3 | 12 | 3.0 | 28 | 4.0 | 7 |
| 18 | 7 | 2.3 | 5 | 1.3 | 12 | 1.7 | 7 |
| 19 | 3 | 1.0 | 5 | 1.3 | 8 | 1.1 | 7 |
| 22 | 6 | 1.5 | 5 | 1.7 | 11 | 1.6 | 7 |
| 24 | 9 | 2.3 | 1 | 0.3 | 10 | 1.4 | 7 |
| 25 | 3 | 0.8 | 6 | 2.0 | 9 | 1.3 | 7 |
| 26 | 7 | 1.8 | 5 | 1.7 | 12 | 1.7 | 7 |
| 27 | 0 | 0.0 | 8 | 2.7 | 8 | 1.3 | 6 |
| 28 | 21 | 7.0 | 12 | 4.0 | 33 | 5.5 | 6 |
| 30 | 4 | 1.3 | 8 | 2.7 | 12 | 2.0 | 6 |
| 31 | 8 | 2.7 | 11 | 2.8 | 19 | 2.7 | 7 |
| 32 | 4 | 1.3 | 6 | 1.5 | 10 | 1.4 | 7 |
| 33 | 1 | 0.3 | 7 | 2.3 | 8 | 1.3 | 6 |
| 34 | 3 | 1.0 | 6 | 1.5 | 9 | 1.3 | 7 |
| Total | 154 | 2.0 | 183 | 2.3 | 337 | 2.2 | 156 |
| # Point Counts | 78 | | 78 | | 156 | | |

NOTE: Includes only birds identified visually during point counts inside the survey area.

TABLE 13: Bird Abundance By Habitat

| Habitat | January | | February | | Total | | # Point Counts |
|----------------|---------|----------|----------|----------|-------|----------|----------------|
| | Count | Birds/PC | Count | Birds/PC | Count | Birds/PC | |
| P | 25 | 1.3 | 53 | 2.7 | 78 | 2.0 | 40 |
| P/NR<30 | 13 | 2.2 | 21 | 2.6 | 34 | 2.4 | 14 |
| NR<30 | 86 | 2.4 | 67 | 2.0 | 153 | 2.2 | 69 |
| NR>30 | 11 | 3.7 | 20 | 5.0 | 31 | 4.4 | 7 |
| NR±30 | 1 | 0.3 | 7 | 2.3 | 8 | 1.3 | 6 |
| OG | 18 | 1.8 | 15 | 1.5 | 33 | 1.7 | 20 |
| Total | 154 | 2.0 | 183 | 2.3 | 337 | 2.2 | 156 |
| # Point Counts | 78 | | 78 | | 156 | | |

NOTE: Includes only birds identified visually during point counts inside the survey area.

TABLE 14: Raw Bird Species Abundance by Station – January/February 2017

| Stations | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
|--------------------------------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| Cracidae | | | | 1 | 1 | | 1 | 1 | | | | | | | | | | | | 2 | 1 | | 1 | 8 |
| Black Guan | | | | 1 | 1 | | 1 | 1 | | | | | | | | | | | | 2 | 1 | | 1 | 8 |
| Odontophoridae | | | | 2 | | | 1 | | | | | | | | | | | | | | | 1 | | 4 |
| Spotted Wood-Quail | | | | 2 | | | 1 | | | | | | | | | | | | | | | 1 | | 4 |
| Apodidae | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| White-collared Swift | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| Trochilidae | | 3 | | 3 | 2 | 4 | 2 | | 1 | 6 | 5 | 1 | 1 | 2 | 2 | 1 | | 2 | 3 | 4 | 2 | | 2 | 46 |
| Green Hermit | | | | | 1 | | | | | 1 | | | | | | | | | | | | | | 2 |
| Magenta-throated Woodstar | | 1 | | | | | | | 1 | | | | | | | | | | | | | | | 2 |
| Purple-crowned Fairy | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | 2 |
| Purple-throated Mountain-Gem | | | | | | | | | | | | | | 1 | | | | | | | | | | 1 |
| Rufous-tailed Hummingbird | | | | | | 1 | | | | | | | | | | | | | | | | | | 1 |
| Scintillant Hummingbird | | | | | | | | | | | | | | | | | | | | | 1 | | | 1 |
| Stripe-tailed Hummingbird | | | | | | | | | | | 1 | | | | | | | | | | | | | 1 |
| Violet Sabrewing | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 |
| White-throated Mountain-gem | | | | | | | | | | 2 | 1 | | | | 1 | | | 2 | | | | | | 6 |
| Hummingbird sp. | | 2 | | 3 | | 2 | 2 | | | 3 | 3 | 1 | 1 | 1 | 1 | 1 | | | 3 | 3 | 1 | | 2 | 29 |
| Columbidae | | | | | | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | 5 |
| Ruddy Pigeon | | | | | | | 1 | 1 | 2 | | | | | | | | | | | | | | | 4 |
| Pigeon sp. | | | | | | 1 | | | | | | | | | | | | | | | | | | 1 |
| Psittacidae | 1 | | | | | | 1 | | | 2 | | | | | | | | | | | | | 2 | 6 |
| Sulphur-winged Parakeet | | | | | | | 1 | | | 2 | | | | | | | | | | | | | 2 | 5 |
| Parrot sp. | 1 | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Cuculidae | | | | | | | | | | | | | | | | | | 2 | | | | | | 2 |
| Squirrel Cuckoo | | | | | | | | | | | | | | | | | | 2 | | | | | | 2 |
| Trogonidae | 1 | | | | | 1 | | | | | | | | | | | | | | | | | 1 | 3 |
| Collared Trogon | 1 | | | | | 1 | | | | | | | | | | | | | | | | | 1 | 3 |
| Momotidae | | | | | | | | | | | | | | | | | | | 1 | | | | | 1 |
| Lesson's Motmot | | | | | | | | | | | | | | | | | | | 1 | | | | | 1 |
| Capitonidae | | | | | | | 1 | 1 | | 1 | | | | | | | | 3 | | | | | | 6 |
| Red-headed Barbet | | | | | | | 1 | 1 | | 1 | | | | | | | | 3 | | | | | | 6 |
| Ramphastidae | | | 2 | 2 | 1 | 1 | 4 | | 1 | 2 | 2 | | | | 1 | | 2 | 2 | | | 1 | | | 21 |
| Northern Emerald-Toucanet | | | 2 | 2 | 1 | 1 | 4 | | 1 | 2 | 2 | | | | 1 | | 2 | 2 | | | 1 | | | 21 |
| Furnariidae | | | | | 1 | | | | | | | | | | | | | | 1 | | | | | 2 |
| Scaly-throated Foliage-gleaner | | | | | | | | | | | | | | | | | | | 1 | | | | | 1 |

| Stations | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
|---------------------------------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| Furnariidae (cont'd) | | | | | 1 | | | | | | | | | | | | | | | | | | | 1 |
| Spot-crowned Woodcreeper | | | | | 1 | | | | | | | | | | | | | | | | | | | 1 |
| Rhinocryptidae | | | | | | | | | 1 | | | | | | | | | | | | | | | 1 |
| Silvery-fronted Tapaculo | | | | | | | | | 1 | | | | | | | | | | | | | | | 1 |
| Tyrannidae | 1 | 1 | | | | | 2 | 3 | 1 | 2 | | | | | | | 1 | 2 | 2 | | 1 | | | 16 |
| Black Phoebe | | | | | | | 1 | | | | | | | | | | | | | | | | | 1 |
| Dusky-capped Flycatcher | | | | | | | | 2 | | | | | | | | | | 1 | 1 | | | | | 4 |
| Golden-bellied Flycatcher | 1 | | | | | | | | 1 | 2 | | | | | | | 1 | | 1 | | 1 | | | 7 |
| Least Flycatcher | | 1 | | | | | | 1 | | | | | | | | | | | | | | | | 2 |
| Yellowish Flycatcher | | | | | | | 1 | | | | | | | | | | | 1 | | | | | | 2 |
| Tityridae | | | | | | | 2 | | | | | | | | | | | | | | | | | 2 |
| Masked Tityra | | | | | | | 2 | | | | | | | | | | | | | | | | | 2 |
| Turdidae | 1 | 1 | 1 | | | | 2 | | | | | | | 1 | | | | 1 | | | | | | 7 |
| Black-billed Nightingale-Thrush | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | 2 |
| Black-faced Solitaire | | | | | | | 1 | | | | | | | 1 | | | | | | | | | | 2 |
| Mountain Thrush | | 1 | | | | | 1 | | | | | | | | | | | 1 | | | | | | 3 |
| Troglodytidae | | | | | | | 2 | | | 2 | 2 | | 5 | 1 | 2 | | | 1 | | | 1 | | | 16 |
| Gray-breasted Wood-Wren | | | | | | | 1 | | | | | | | 1 | 2 | | | | | | 1 | | | 5 |
| Rufous-breasted Wren | | | | | | | 1 | | | 2 | 2 | | 5 | | | | | 1 | | | | | | 11 |
| Vireonidae | | | | | | | | 1 | 1 | | | | | | | | | 1 | | | | 1 | | 4 |
| Philadelphia Vireo | | | | | | | | 1 | 1 | | | | | | | | | 1 | | | | 1 | | 4 |
| Parulidae | 3 | 1 | 5 | | 2 | | 6 | 6 | 8 | 4 | 1 | 1 | 2 | 2 | | 1 | 4 | 9 | 2 | 7 | 3 | 4 | | 71 |
| Black-and-white Warbler | | 1 | | | | | 2 | 1 | | | | | | | | | 1 | 1 | | 2 | | 1 | | 9 |
| Blackburnian Warbler | | | | | | | 1 | | | | | | | | | | | | | | | | | 1 |
| Collared Redstart | | | | | | | | | | 2 | | | | | | | | | | | | | | 2 |
| Costa Rican Warbler | | | | | | | | | 2 | | | | | | | 1 | | | | | | | | 3 |
| Flame-throated Warbler | | | | | 1 | | | 1 | | | | | | | | | | | | | | | | 2 |
| Slate-throated Redstart | 3 | | 4 | | | | 3 | 2 | 3 | 1 | | 1 | 1 | 1 | | | 3 | 1 | 2 | 4 | 3 | 2 | | 34 |
| Tennessee Warbler | | | 1 | | 1 | | | 1 | 3 | | | | | | | | | 5 | | 1 | | 1 | | 13 |
| Tropical Parula | | | | | | | | | | | | | | | | | | 1 | | | | | | 1 |
| Wilson's Warbler | | | | | | | | 1 | | | 1 | | 1 | | | | | 1 | | | | | | 4 |
| Worm-eating Warbler | | | | | | | | | | 1 | | | | 1 | | | | | | | | | | 2 |
| Thraupidae | | 1 | 1 | | 1 | | | 1 | 1 | | | | | | | | | 5 | | | | 1 | | 11 |
| Bay-headed Tanager | | | | | | | | | | | | | | | | | | 1 | | | | | | 1 |
| Blue Dacnis | | | | | | | | | | | | | | | | | | 1 | | | | | | 1 |
| Golden-hooded Tanager | | | 1 | | | | | | | | | | | | | | | | | | | | | 1 |
| Scarlet-thighed Dacnis | | | | | | | | | | | | | | | | | | 1 | | | | | | 1 |

| Stations | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
|-----------------------------------|----|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| <i>Thraupidae (cont'd)</i> | | | | | | | | | | | | | | | | | | | | | | | | |
| Silver-throated Tanager | | | | | 1 | | | 1 | 1 | | | | | | | | | 2 | | | | 1 | | 6 |
| Yellow-faced Grassquit | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| <i>Emberizidae</i> | 11 | | 3 | | 5 | | 3 | 2 | 5 | 8 | 1 | 4 | | 3 | 4 | 8 | 1 | | 3 | 6 | | 1 | 3 | 71 |
| Chestnut-capped Brush-Finch | | | 2 | | | | 3 | | 1 | 1 | | | | 1 | | 1 | | | 1 | | | | 2 | 12 |
| Common Chlorospingus | 9 | | 1 | | 3 | | | 2 | 3 | 5 | 1 | | | 2 | 3 | 4 | 1 | | 2 | 6 | | 1 | | 43 |
| Yellow-thighed Finch | 2 | | | | 2 | | | | 1 | 2 | | 4 | | | 1 | 3 | | | | | | | 1 | 16 |
| <i>Cardinalidae</i> | | 2 | | | 1 | | | 1 | | | | | | | | | | 3 | | | | | | 7 |
| Black-thighed Grosbeak | | | | | | | | | | | | | | | | | | 1 | | | | | | 1 |
| Flame-colored Tanager | | 2 | | | 1 | | | | | | | | | | | | | 2 | | | | | | 5 |
| White-winged Tanager | | | | | | | | 1 | | | | | | | | | | | | | | | | 1 |
| <i>Uncertain Family</i> | | 1 | 2 | 1 | 3 | | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | | 2 | | 2 | | | 1 | | | 25 |
| Passerine sp. | | 1 | 2 | 1 | 3 | | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | | 2 | | 2 | | | 1 | | | 25 |

Note: Birds that were seen but not identified to species level, were recorded to the lowest identifiable taxon. These were recorded as [lowest identifiable taxon] sp.

TABLE 15: Bird Species Abundance Per 10 Point Counts by Station – January/February 2017

| Stations | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| # Point Counts | 7 | 7 | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 7 | 7 | 6 | 7 | 156 |
| Cracidae | | | | 1.4 | 1.4 | | 1.4 | 1.4 | | | | | | | | | | | | 2.9 | 1.4 | | 1.4 | 0.51 |
| Black Guan | | | | 1.4 | 1.4 | | 1.4 | 1.4 | | | | | | | | | | | | 2.9 | 1.4 | | 1.4 | 0.51 |
| Odontophoridae | | | | 2.9 | | | 1.4 | | | | | | | | | | | | | | | 1.7 | | 0.26 |
| Spotted Wood-Quail | | | | 2.9 | | | 1.4 | | | | | | | | | | | | | | | 1.7 | | 0.26 |
| Apodidae | | | | | | | | | | | | | 1.4 | | | | | | | | | | | 0.64 |
| White-collared Swift | | | | | | | | | | | | | 1.4 | | | | | | | | | | | 0.64 |
| Trochilidae | | 4.3 | | 4.3 | 2.9 | 6.7 | 2.9 | | 1.4 | 8.6 | 7.1 | 1.4 | 1.4 | 2.9 | 2.9 | 1.4 | | 3.3 | 5.0 | 5.7 | 2.9 | | 2.9 | 2.95 |
| Green Hermit | | | | | 1.4 | | | | | 1.4 | | | | | | | | | | | | | | 0.13 |
| Magenta-throated Woodstar | | 1.4 | | | | | | | 1.4 | | | | | | | | | | | | | | | 0.13 |
| Purple-crowned Fairy | | | | | 1.4 | 1.7 | | | | | | | | | | | | | | | | | | 0.13 |
| Purple-throated Mountain-Gem | | | | | | | | | | | | | | 1.4 | | | | | | | | | | 0.64 |
| Rufous-tailed Hummingbird | | | | | | 1.7 | | | | | | | | | | | | | | | | | | 0.64 |
| Scintillant Hummingbird | | | | | | | | | | | | | | | | | | | | | 1.4 | | | 0.64 |
| Stripe-tailed Hummingbird | | | | | | | | | | | 1.4 | | | | | | | | | | | | | 0.64 |
| Violet Sabrewing | | | | | | | | | | | | | | | | | | | | 1.4 | | | | 0.64 |
| White-throated Mountain-gem | | | | | | | | | | 2.9 | 1.4 | | | | 1.4 | | | 3.3 | | | | | | 0.38 |
| Hummingbird sp. | | 2.9 | | 4.3 | | 3.3 | 2.9 | | | 4.3 | 4.3 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | | | 5.0 | 4.3 | 1.4 | | 2.9 | 1.86 |
| Columbidae | | | | | | 1.7 | 1.4 | 1.4 | 2.9 | | | | | | | | | | | | | | | 0.33 |
| Ruddy Pigeon | | | | | | | 1.4 | 1.4 | 2.9 | | | | | | | | | | | | | | | 0.26 |
| Pigeon sp. | | | | | | 1.7 | | | | | | | | | | | | | | | | | | 0.64 |
| Psittacidae | 1.4 | | | | | | 1.4 | | | 2.9 | | | | | | | | | | | | | 2.9 | 0.38 |
| Sulphur-winged Parakeet | | | | | | | 1.4 | | | 2.9 | | | | | | | | | | | | | 2.9 | 0.33 |
| Parrot sp. | 1.4 | | | | | | | | | | | | | | | | | | | | | | | 0.64 |
| Cuculidae | | | | | | | | | | | | | | | | | | 3.3 | | | | | | 0.13 |
| Squirrel Cuckoo | | | | | | | | | | | | | | | | | | 3.3 | | | | | | 0.13 |
| Trogonidae | 1.4 | | | | | 1.7 | | | | | | | | | | | | | | | | | 1.4 | 0.19 |
| Collared Trogon | 1.4 | | | | | 1.7 | | | | | | | | | | | | | | | | 1.4 | | 0.19 |
| Momotidae | | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.64 |
| Lesson's Motmot | | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.64 |
| Capitonidae | | | | | | | 1.4 | 1.4 | | 1.4 | | | | | | | | 5.0 | | | | | | 0.38 |
| Red-headed Barbet | | | | | | | 1.4 | 1.4 | | 1.4 | | | | | | | | 5.0 | | | | | | 0.38 |
| Ramphastidae | | | 2.9 | 2.9 | 1.4 | 1.7 | 5.7 | | 1.4 | 2.9 | 2.9 | | | | 1.4 | | 3.3 | 3.3 | | | 1.4 | | | 1.35 |
| Northern Emerald-Toucanet | | | 2.9 | 2.9 | 1.4 | 1.7 | 5.7 | | 1.4 | 2.9 | 2.9 | | | | 1.4 | | 3.3 | 3.3 | | | 1.4 | | | 1.35 |

| Stations | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
|---------------------------------|-----|-----|-----|---|-----|----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|----|-------|
| Furnariidae | 1.4 | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.13 |
| Scaly-throated Foliage-gleaner | | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.64 |
| Spot-crowned Woodcreeper | | | | | 1.4 | | | | | | | | | | | | | | | | | | | 0.64 |
| Rhinocryptidae | 1.4 | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.64 |
| Silvery-fronted Tapaculo | | | | | | | | | 1.4 | | | | | | | | | | | | | | | 0.64 |
| Tyrannidae | 1.4 | 1.4 | | | | | 2.9 | 4.3 | 1.4 | 2.9 | | | | | | | 1.7 | 3.3 | 3.3 | | 1.4 | | | 1.26 |
| Black Phoebe | | | | | | | 1.4 | | | | | | | | | | | | | | | | | 0.64 |
| Dusky-capped Flycatcher | | | | | | | | 2.9 | | | | | | | | | | 1.7 | 1.7 | | | | | 0.26 |
| Golden-bellied Flycatcher | 1.4 | | | | | | | | 1.4 | 2.9 | | | | | | | 1.7 | | 1.7 | | 1.4 | | | 0.45 |
| Least Flycatcher | | 1.4 | | | | | | 1.4 | | | | | | | | | | | | | | | | 0.13 |
| Yellowish Flycatcher | | | | | | | 1.4 | | | | | | | | | | | 1.7 | | | | | | 0.13 |
| Tityridae | 2.9 | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.13 |
| Masked Tityra | | | | | | | 2.9 | | | | | | | | | | | | | | | | | 0.13 |
| Turdidae | 1.4 | 1.4 | 1.4 | | | | 2.9 | | | | | | | 1.4 | | | | 1.7 | | | | | | 0.45 |
| Black-billed Nightingale-Thrush | 1.4 | | 1.4 | | | | | | | | | | | | | | | | | | | | | 0.13 |
| Black-faced Solitaire | | | | | | | 1.4 | | | | | | | 1.4 | | | | | | | | | | 0.13 |
| Mountain Thrush | | 1.4 | | | | | 1.4 | | | | | | | | | | | 1.7 | | | | | | 0.19 |
| Troglodytidae | 2.9 | | | | | | | | | | | | | | | | | | 1.7 | | | | | 1.26 |
| Gray-breasted Wood-Wren | | | | | | | 1.4 | | | | | | | 1.4 | 2.9 | | | | | | 1.4 | | | 0.33 |
| Rufous-breasted Wren | | | | | | | 1.4 | | | 2.9 | 2.9 | | 7.1 | | | | | 1.7 | | | | | | 0.75 |
| Vireonidae | 1.4 | | | | | | | | | | | | | | | | | | 1.7 | | | | | 0.26 |
| Philadelphia Vireo | | | | | | | | 1.4 | 1.4 | | | | | | | | | 1.7 | | | | 1.7 | | 0.26 |
| Parulidae | 4.3 | 1.4 | 7.1 | | 2.9 | | 8.6 | 8.6 | 11.4 | 5.7 | 1.4 | 1.4 | 2.9 | 2.9 | | 1.4 | 6.7 | 15.0 | 3.3 | 1.0 | 4.3 | 6.7 | | 4.55 |
| Black-and-white Warbler | | 1.4 | | | | | 2.9 | 1.4 | | | | | | | | | 1.7 | 1.7 | | 2.9 | | 1.7 | | 0.58 |
| Blackburnian Warbler | | | | | | | 1.4 | | | | | | | | | | | | | | | | | 0.64 |
| Collared Redstart | | | | | | | | | | 2.9 | | | | | | | | | | | | | | 0.13 |
| Costa Rican Warbler | | | | | | | | | 2.9 | | | | | | | 1.4 | | | | | | | | 0.19 |
| Flame-throated Warbler | | | | | 1.4 | | | 1.4 | | | | | | | | | | | | | | | | 0.13 |
| Slate-throated Redstart | 4.3 | | 5.7 | | | | 4.3 | 2.9 | 4.3 | 1.4 | | 1.4 | 1.4 | 1.4 | | | 5.0 | 1.7 | 3.3 | 5.7 | 4.3 | 3.3 | | 2.18 |
| Tennessee Warbler | | | 1.4 | | 1.4 | | | 1.4 | 4.3 | | | | | | | | | 8.3 | | 1.4 | | 1.7 | | 0.83 |
| Tropical Parula | | | | | | | | | | | | | | | | | | 1.7 | | | | | | 0.64 |
| Wilson's Warbler | | | | | | | | 1.4 | | | 1.4 | | 1.4 | | | | | 1.7 | | | | | | 0.26 |
| Worm-eating Warbler | | | | | | | | | | 1.4 | | | | 1.4 | | | | | | | | | | 0.13 |
| Thraupidae | 1.4 | | | | | | | | | | | | | | | | | | 8.3 | | | | | 0.75 |
| Bay-headed Tanager | | | | | | | | | | | | | | | | | | 1.7 | | | | | | 0.64 |
| Blue Dacnis | | | | | | | | | | | | | | | | | | 1.7 | | | | | | 0.64 |
| Golden-hooded Tanager | | | 1.4 | | | | | | | | | | | | | | | | | | | | | 0.64 |

| Stations | 1 | 3 | 5 | 7 | 9 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | Total |
|-----------------------------|------|-----|-----|-----|-----|----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-------|
| <i>Thraupidae (cont'd)</i> | | | | | | | | | | | | | | | | | | | | | | | | |
| Scarlet-thighed Dacnis | | | | | | | | | | | | | | | | | | 1.7 | | | | | | 0.64 |
| Silver-throated Tanager | | | | | 1.4 | | | 1.4 | 1.4 | | | | | | | | | 3.3 | | | | 1.7 | | 0.38 |
| Yellow-faced Grassquit | | 1.4 | | | | | | | | | | | | | | | | | | | | | | 0.64 |
| <i>Emberizidae</i> | 15.7 | | 4.3 | | 7.1 | | 4.3 | 2.9 | 7.1 | 11.4 | 1.4 | 5.7 | | 4.3 | 5.7 | 11.4 | 1.7 | | 5.0 | 8.6 | | 1.7 | 4.3 | 4.55 |
| Chestnut-capped Brush-Finch | | | 2.9 | | | | 4.3 | | 1.4 | 1.4 | | | | 1.4 | | 1.4 | | | 1.7 | | | | 2.9 | 0.77 |
| Common Chlorospingus | 12.9 | | 1.4 | | 4.3 | | | 2.9 | 4.3 | 7.1 | 1.4 | | | 2.9 | 4.3 | 5.7 | 1.7 | | 3.3 | 8.6 | | 1.7 | | 2.76 |
| Yellow-thighed Finch | 2.9 | | | | 2.9 | | | | 1.4 | 2.9 | | 5.7 | | | 1.4 | 4.3 | | | | | | | 1.4 | 1.26 |
| <i>Cardinalidae</i> | | 2.9 | | | 1.4 | | | 1.4 | | | | | | | | | | 5.0 | | | | | | 0.45 |
| Black-thighed Grosbeak | | | | | | | | | | | | | | | | | | 1.7 | | | | | | 0.64 |
| Flame-colored Tanager | | 2.9 | | | 1.4 | | | | | | | | | | | | | 3.3 | | | | | | 0.33 |
| White-winged Tanager | | | | | | | | 1.4 | | | | | | | | | | | | | | | | 0.64 |
| <i>Uncertain Family</i> | | 1.4 | 2.9 | 1.4 | 4.3 | | 4.3 | 2.9 | 1.4 | 1.4 | 1.4 | 2.9 | 2.9 | 1.4 | | 2.9 | | 3.3 | | | 1.4 | | | 1.63 |
| Passerine sp. | | 1.4 | 2.9 | 1.4 | 4.3 | | 4.3 | 2.9 | 1.4 | 1.4 | 1.4 | 2.9 | 2.9 | 1.4 | | 2.9 | | 3.3 | | | 1.4 | | | 1.63 |

Red = Most abundant taxa at that station; **Blue** = 2nd most abundant taxa at that station. **Red** = Most abundant family at that station; **Blue** = 2nd most abundant family at that station.
Note: Birds that were seen but not identified to species level, were recorded to the lowest identifiable taxon. These were recorded as [lowest identifiable taxon] sp.

TABLE 16: Bird Species Abundance Per 10 Point Counts by Habitat – January/February 2017

| Habitat | P | P/NR<30 | NR<30 | NR>30 | NR±30 | OG | Total |
|---------------------------------|-----|---------|-------|-------|-------|-----|-------|
| # Point Counts | 40 | 14 | 69 | 7 | 6 | 20 | 156 |
| Cracidae | 0.5 | | 0.4 | 1.4 | | 1.0 | 0.51 |
| Black Guan | 0.5 | | 0.4 | 1.4 | | 1.0 | 0.51 |
| Odontophoridae | | | 0.3 | 1.4 | 1.7 | | 0.26 |
| Spotted Wood-Quail | | | 0.3 | 1.4 | 1.7 | | 0.26 |
| Apodidae | | | 0.1 | | | | 0.06 |
| White-collared Swift | | | 0.1 | | | | 0.06 |
| Trochilidae | 2.0 | 4.3 | 3.2 | 2.9 | | 4.0 | 2.95 |
| Green Hermit | | | 0.1 | | | 0.5 | 0.13 |
| Magenta-throated Woodstar | 0.3 | 0.7 | | | | | 0.13 |
| Purple-crowned Fairy | | | | | | 1.0 | 0.13 |
| Purple-throated Mountain-Gem | | | 0.1 | | | | 0.06 |
| Rufous-tailed Hummingbird | | | | | | 0.5 | 0.06 |
| Scintillant Hummingbird | 0.3 | | | | | | 0.06 |
| Stripe-tailed Hummingbird | | 0.7 | | | | | 0.06 |
| Violet Sabrewing | | | 0.1 | | | | 0.06 |
| White-throated Mountain-gem | | 0.7 | 0.7 | | | | 0.38 |
| Hummingbird sp. | 1.5 | 2.1 | 2.0 | 2.9 | | 2.0 | 1.86 |
| Columbidae | 0.3 | 1.4 | | 1.4 | | 0.5 | 0.32 |
| Ruddy Pigeon | 0.3 | 1.4 | | 1.4 | | | 0.26 |
| Pigeon sp. | | | | | | 0.5 | 0.06 |
| Psittacidae | 0.3 | | 0.3 | 1.4 | | 1.0 | 0.38 |
| Sulphur-winged Parakeet | | | 0.3 | 1.4 | | 1.0 | 0.32 |
| Parrot sp. | 0.3 | | | | | | 0.06 |
| Cuculidae | | | 0.3 | | | | 0.13 |
| Squirrel Cuckoo | | | 0.3 | | | | 0.13 |
| Trogonidae | 0.3 | | | | | 1.0 | 0.19 |
| Collared Trogon | 0.3 | | | | | 1.0 | 0.19 |
| Momotidae | 0.3 | | | | | | 0.06 |
| Lesson's Motmot | 0.3 | | | | | | 0.06 |
| Capitonidae | 0.3 | | 0.6 | 1.4 | | | 0.38 |
| Red-headed Barbet | 0.3 | | 0.6 | 1.4 | | | 0.38 |
| Ramphastidae | 0.8 | 2.1 | 1.3 | 5.7 | | 1.0 | 1.35 |
| Northern Emerald-Toucanet | 0.8 | 2.1 | 1.3 | 5.7 | | 1.0 | 1.35 |
| Furnariidae | 0.3 | | | | | 0.5 | 0.13 |
| Scaly-throated Foliage-gleaner | 0.3 | | | | | | 0.06 |
| Spot-crowned Woodcreeper | | | | | | 0.5 | 0.06 |
| Rhinocryptidae | | 0.7 | | | | | 0.06 |
| Silvery-fronted Tapaculo | | 0.7 | | | | | 0.06 |
| Tyrannidae | 2.3 | 0.7 | 0.6 | 2.9 | | | 1.03 |
| Black Phoebe | | | | 1.4 | | | 0.06 |
| Dusky-capped Flycatcher | 0.8 | | 0.1 | | | | 0.26 |
| Golden-bellied Flycatcher | 1.0 | 0.7 | 0.3 | | | | 0.45 |
| Least Flycatcher | 0.5 | | | | | | 0.13 |
| Yellowish Flycatcher | | | 0.1 | 1.4 | | | 0.13 |
| Tityridae | | | | 2.9 | | | 0.13 |
| Masked Tityra | | | | 2.9 | | | 0.13 |
| Turdidae | 0.5 | | 0.4 | 2.9 | | | 0.45 |
| Black-billed Nightingale-Thrush | 0.3 | | 0.1 | | | | 0.13 |
| Black-faced Solitaire | | | 0.1 | 1.4 | | | 0.13 |
| Mountain Thrush | 0.3 | | 0.1 | 1.4 | | | 0.19 |

| Habitat | P | P/NR<30 | NR<30 | NR>30 | NR±30 | OG | Total |
|-----------------------------|-----|---------|-------|-------|-------|-----|-------|
| Troglodytidae | 0.3 | 1.4 | 1.6 | 2.9 | | | 1.03 |
| Gray-breasted Wood-Wren | 0.3 | | 0.4 | 1.4 | | | 0.32 |
| Rufous-breasted Wren | | 1.4 | 1.2 | 1.4 | | | 0.71 |
| Vireonidae | 0.3 | 0.7 | 0.1 | | 1.7 | | 0.26 |
| Philadelphia Vireo | 0.3 | 0.7 | 0.1 | | 1.7 | | 0.26 |
| Parulidae | 4.8 | 6.4 | 4.5 | 8.6 | 6.7 | 1.0 | 4.55 |
| Black-and-white Warbler | 0.8 | | 0.4 | 2.9 | 1.7 | | 0.58 |
| Blackburnian Warbler | | | | 1.4 | | | 0.06 |
| Collared Redstart | | | 0.3 | | | | 0.13 |
| Costa Rican Warbler | | 1.4 | 0.1 | | | | 0.19 |
| Flame-throated Warbler | 0.3 | | | | | 0.5 | 0.13 |
| Slate-throated Redstart | 3.3 | 2.1 | 1.9 | 4.3 | 3.3 | | 2.18 |
| Tennessee Warbler | 0.3 | 2.1 | 1.0 | | 1.7 | 0.5 | 0.83 |
| Tropical Parula | | | 0.1 | | | | 0.06 |
| Wilson's Warbler | 0.3 | 0.7 | 0.3 | | | | 0.26 |
| Worm-eating Warbler | | | 0.3 | | | | 0.13 |
| Thraupidae | 0.5 | 0.7 | 0.9 | | 1.7 | 0.5 | 0.71 |
| Bay-headed Tanager | | | 0.1 | | | | 0.06 |
| Blue Dacnis | | | 0.1 | | | | 0.06 |
| Golden-hooded Tanager | | | 0.1 | | | | 0.06 |
| Scarlet-thighed Dacnis | | | 0.1 | | | | 0.06 |
| Silver-throated Tanager | 0.3 | 0.7 | 0.3 | | 1.7 | 0.5 | 0.38 |
| Yellow-faced Grassquit | 0.3 | | | | | | 0.06 |
| Emberizidae | 4.3 | 4.3 | 5.2 | 4.3 | 1.7 | 4.0 | 4.55 |
| Chestnut-capped Brush-Finch | 0.3 | 0.7 | 0.7 | 4.3 | | 1.0 | 0.77 |
| Common Chlorospingus | 3.5 | 2.9 | 3.0 | | 1.7 | 1.5 | 2.76 |
| Yellow-thighed Finch | 0.5 | 0.7 | 1.4 | | | 1.5 | 1.03 |
| Cardinalidae | 0.8 | | 0.4 | | | 0.5 | 0.45 |
| Black-thighed Grosbeak | | | 0.1 | | | | 0.06 |
| Flame-colored Tanager | 0.5 | | 0.3 | | | 0.5 | 0.32 |
| White-winged Tanager | 0.3 | | | | | | 0.06 |
| Uncertain Family | 1.0 | 1.4 | 1.9 | 4.3 | | 1.5 | 1.60 |
| Passerine sp. | 1.0 | 1.4 | 1.9 | 4.3 | | 1.5 | 1.60 |

P = Planted, NR<30 = Natural Regeneration Under 30 Years, NR>30 = Natural Regeneration Over 30 Years, NR±30 = Natural Regeneration Over and Under 30 Years, P/NR<30 = Planted and Natural Regeneration Under 30 Years, OG = Old Growth.

Red = Most abundant taxa at that station; **Blue** = 2nd most abundant taxa at that station. **Red** = Most abundant family at that station; **Blue** = 2nd most abundant family at that station.

3.3.2 THREATENED SPECIES ABUNDANCE

3.3.2.1 BLACK GUAN

Black Guan was only identified inside the survey area during point count surveys at an overall abundance of 0.51/10 PC (Table 15). It was found at 7 stations (7, 9, 14, 15, 31, 32, and 34), was most abundant at Station 31 (2.9/10 PC), and was found at an abundance of 1.4/10 PC at all other stations. Black Guan were primarily found in NR>30 (1.4/10 PC), followed by OG (1.0/10 PC), P (0.5/10 PC), and NR<30 (0.4/10 PC) (Table 16). They were not found at all in P/NR<30 or NR±30.

3.3.2.2 RESPLENDENT QUETZAL

Resplendent Quetzal was identified by its call, both inside and outside the survey area during point counts. Single individuals were heard at stations 9 and 34, both in the OG, on February 14th and 21st (Table 14).

3.3.2.3 RUDDY PIGEON

Ruddy Pigeon was identified both during point counts and walking surveys, with an overall point count abundance of 0.26/10 PC (Table 15). It was found at 3 stations (14, 15 and 16), was most abundant at Station 16 (2.9/10 PC), and was found at an abundance of 1.4/10 PC at the other two stations. Ruddy Pigeon were primarily found in P/NR<30 and NR>30 (1.4/10 PC), followed by P (0.3/10 PC) (Table 16). They were not found at all in P/NR<30, NR±30, or OG.

3.4 RICHNESS & DIVERSITY

Overall, 56 bird species from 22 different families were identified during point count surveys with, in total, 0.36 species identified per point count (Table 17). The highest species richness was found at stations 28 (3.33 species/PC), 14 (2.43 species/PC) and 15 (2.00 species/PC). The lowest species richness was found at stations 19 (0.29 species/PC), 7 (0.43 species/PC), 22 and 26 (0.57 species/PC). Looking at habitats, the highest species richness was found in NR>30 (2.4 species/PC), and the lowest in NR<30 (0.6 species/PC) (Table 18).

Overall, SID was 0.944 (Table 17). The highest SIDs were found at stations 12 (1.000), 15 (0.978), and 24 and 33 (0.964), while the lowest were found at stations 19 (0.400), 22 (0.643), and 1 (0.706). Looking at habitats, the highest SID was found in NR±30 (0.964) and the lowest in P (0.912) (Table 18). As SID is calculated from raw count data, the data was not standardized to account for different numbers of point counts, so is not directly comparable unless the number of point counts is the same.

TABLE 17: Richness and Diversity By Station

| Station | # Point Counts | Family Richness | Species Richness ¹ | Species Richness/ Point Count | SID ² |
|---------|----------------|-----------------|-------------------------------|----------------------------------|------------------|
| 1 | 7 | 6 | 6 | 0.86 | 0.706 |
| 3 | 7 | 6 | 6 | 0.86 | 0.952 |
| 5 | 7 | 5 | 7 | 1.00 | 0.879 |
| 7 | 7 | 4 | 3 | 0.43 | 0.800 |
| 9 | 7 | 8 | 11 | 1.57 | 0.956 |
| 12 | 6 | 4 | 4 | 0.67 | 1.000 |
| 14 | 7 | 13 | 17 | 2.43 | 0.957 |
| 15 | 7 | 9 | 14 | 2.00 | 0.978 |
| 16 | 7 | 9 | 13 | 1.86 | 0.948 |
| 17 | 7 | 8 | 13 | 1.86 | 0.938 |
| 18 | 7 | 5 | 6 | 0.86 | 0.929 |
| 19 | 7 | 3 | 2 | 0.29 | 0.400 |
| 20* | | | | | |
| 22 | 7 | 4 | 4 | 0.57 | 0.643 |
| 24 | 7 | 5 | 7 | 1.00 | 0.964 |
| 25 | 7 | 4 | 5 | 0.71 | 0.857 |
| 26 | 7 | 3 | 4 | 0.57 | 0.750 |
| 27 | 6 | 4 | 5 | 0.83 | 0.857 |
| 28 | 6 | 11 | 20 | 3.33 | 0.961 |
| 30 | 6 | 6 | 7 | 1.17 | 0.944 |
| 31 | 7 | 4 | 6 | 0.86 | 0.808 |
| 32 | 7 | 6 | 6 | 0.86 | 0.893 |
| 33 | 6 | 5 | 7 | 1.17 | 0.964 |
| 34 | 7 | 5 | 5 | 0.71 | 0.905 |
| Overall | 156 | 22 | 56 | 0.36 | 0.944 |

1, Species richness only includes birds identified to species level; 2, Simpson's Index of Diversity.

*, Station 20 not sampled during the January/February 2017 survey period.

TABLE 18: Richness and Diversity By Habitat

| Station | # Point Counts | Family Richness | Species Richness ¹ | Species Richness/ Point Count | SID ² |
|---------|----------------|-----------------|-------------------------------|----------------------------------|------------------|
| P | 40 | 17 | 28 | 0.7 | 0.912 |
| P/NR<30 | 14 | 10 | 17 | 1.2 | 0.956 |
| NR<30 | 69 | 16 | 38 | 0.6 | 0.941 |
| NR>30 | 7 | 13 | 17 | 2.4 | 0.957 |
| NR±30 | 6 | 5 | 7 | 1.2 | 0.964 |
| OG | 20 | 11 | 15 | 0.8 | 0.960 |
| Overall | 156 | 22 | 56 | 0.4 | 0.944 |

1, Species richness only includes birds identified to species level; 2, Simpson's Index of Diversity.

4 ACKNOWLEDGEMENTS

We would like to thank Frank Spooner for training us in bird spotting and identification, and Tom Gode and Linda Moskalyk for their general support and welcoming us to the reserve.

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