



Bird Monitoring Study Data Report

Jan 2013 – Dec 2016

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Cloudbridge Nature Reserve
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Photos: Nathan Marcy

Common Chlorospingus
(*Chlorospingus flavopectus*)

Slate-throated Redstart
(*Myioborus miniatus*)

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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 project so far and does not present an 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 ($NR \pm 30$), and
- 6) Old growth forest (OG).

2 LOCATIONS

Since it began in 2013, survey locations have been added and dropped from the study. As a result, the station numbers are often not sequential along the trails, and several numbers are not in use. The survey locations have remained stable since March 2016, and will remain so going forward.

2.1 CURRENT LOCATIONS

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 3.1.3). 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.



FIGURE 1: Example of a bird station marker.

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

2.3 HISTORIC LOCATIONS

There are 12 bird stations that were surveyed as part of the point count study, but that were dropped from the study prior to March 2016 (Figure 3). A summary of these locations is provided in Table 2.

TABLE 2: Summary Information on Historic Bird Stations

Bird Station	Habitat Type	Trail	Elevation (m)	First Surveyed	Last Surveyed	Reason Dropped	Latitude ¹	Longitude ¹
2	P	Montaña	1784	21-Oct-2014	22-Jun-2015	Too close to other stations	9.472483	-83.568533
4	P/NR<30	Montaña	1910	30-Oct-2013	22-Jun-2015	Too close to other stations	9.470683	-83.566817
6	NR<30	Montaña	2013	12-Nov-2013	8-Jun-2015	Too close to other stations	9.468567	-83.565850
8	OG	Montaña	2116	25-Feb-2013	11-Nov-2014	Too close to other stations	9.465150	-83.565833
10	OG	Chirripó	2092	7-Nov-2013	16-Jun-2015	Could not locate original marker. Deemed too far away to survey regularly.	9.464767	-83.568150
11	OG	Chirripó	2037	22-Feb-2013	16-Jun-2015	Deemed too far away to survey regularly.	9.465483	-83.569933
13	OG	Gavilan	1944	22-Feb-2013	26-Feb-2016	Moved location to align with other monitoring studies	9.465533	-83.570017
29	NR±30	El Jilguero	1864	26-Jul-2013	29-Nov-2016	Moved location to align with other monitoring studies	9.467550	-83.573683
D	Unknown	Skutch	Unknown	26-Feb-2013	3-Mar-2013	No coordinates were recorded. Unsure of location.	Unknown	Unknown
G	Unknown	Los Quetzales	1736	1-Jan-2013	1-Jan-2013	Los Quetzales dropped from survey.	9.476000	-83.567383
H	Unknown	Los Quetzales	1781	1-Jan-2013	1-Jan-2013	Noise from creek deemed too loud.	9.477783	-83.566650
I	Unknown	Los Quetzales	1810	1-Jan-2013	1-Jan-2013	Los Quetzales dropped from survey.	9.479850	-83.566400

P = Planted, NR<30 = Natural Regeneration Under 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



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



FIGURE 3: Locations of bird point count stations used prior to March 2016.

3 METHODS

3.1 CURRENT METHODS

The methods described in this section have been in effect in their entirety since March 2016. Some aspects, such as the training requirements, may have been in effect for longer. Methods used previous to March 2016 are described in Section 3.2.

3.1.1 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.

3.1.2 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.

Starting in October 2016, walking surveys were completed in conjunction with point count surveys. Each walking survey route is completed once in a 2 week period, scheduled every two days (Table 3). 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. The surveys are staggered in the schedule so that each route (Figures 6-15) is completed once a month.

TABLE 3: Example Point Count Survey Schedule Including Walking Surveys

Survey Week	Monday	Tuesday	Wednesday	Thursday	Friday
1	Montaña (1, 3, 5, 7, 9)	El Jilguero (30, 27, 28, 33, 12) & Walking Survey	Sentinel & Gavilan (32, 16, 15, 14, 34)	Don Victor (22, 24, 25, 26) & Walking Survey	Principal & Rio (31, 17, 18, 19, 20)
2	Montaña (9, 7, 5, 3, 1) & Walking Survey	El Jilguero (12, 33, 28, 27, 30)	Gavilan & Sentinel (34, 14, 15, 16, 32) & Walking Survey	Don Victor (26, 25, 24, 22)	Rio & Principal (20, 19, 28, 17, 31) & Walking Survey
3	Montaña (1, 3, 5, 7, 9) & Walking Survey	El Jilguero (30, 27, 28, 33, 12)	Sentinel & Gavilan (32, 16, 15, 14, 34) & Walking Survey	Don Victor (22, 24, 25, 26)	Principal & Rio (31, 17, 18, 19, 20) & Walking Survey
4	Montaña (9, 7, 5, 3, 1)	El Jilguero (12, 33, 28, 27, 30) & Walking Survey	Gavilan & Sentinel (34, 14, 15, 16, 32)	Don Victor (26, 25, 24, 22) & Walking Survey	Rio & Principal (20, 19, 28, 17, 31)

3.1.3 POINT COUNTS

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 2017b) 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 4). 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 5).

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.

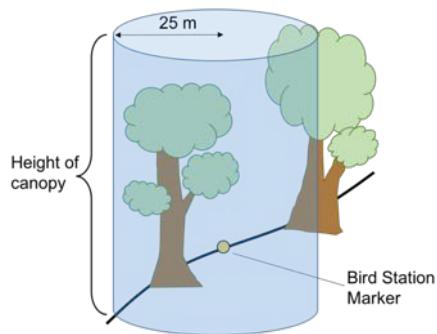


FIGURE 4: Point Count Survey Area

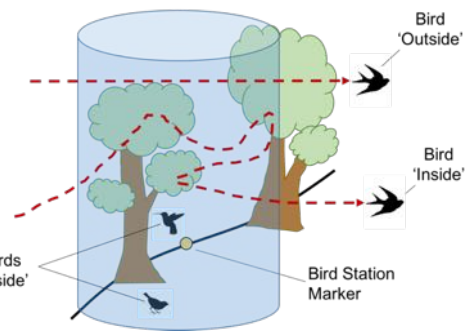


FIGURE 5: Inside vs Outside of Survey Area

3.1.3.1 DATA ANALYSIS

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.

Richness

All species identified during point counts and walking surveys in each survey year 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.

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 and 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.

3.1.4 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.

3.1.4.1 LOCATIONS

Walking survey locations depend on which bird point counts are being surveyed (and in which order) on a walking survey day (Table 10). Suggested routes (Figures 6 to 15) are provided to interns in an effort to have all the trails (including side trails) in Cloudbridge surveyed during the walking surveys. Additional trails can be added if time allows and surveyors have the option of focusing on specific areas if there is high bird presence in one area over another.

TABLE 10: Suggested Walking Survey Routes by Survey Group

Survey Group	Station Order	Figure Showing Suggested Route	Trails Covered
Montaña/Chirripó	1, 3, 5, 7, 9	5	Montaña, Chirripó, top portion of El Jilguero, Gavilan/El Jilguero connector
	9, 7, 5, 3, 1	6	Chirripó, Montaña, Principal, Heliconia
Sentinel/Gavilan	32, 16, 15, 14, 34	7	Sentinel, Gavilan, top portion of El Jilguero, Chirripó
	34, 14, 15, 16, 32	8	Gavilan, Sentinel, Heliconia
Principal/Rio	31, 17, 18, 19, 20	9	Principal, Rio, Waterfall
	20, 19, 18, 17, 31	10	Rio, Principal, Waterfall, road to San Gerardo
Don Victor	22, 24, 25, 26	11	Don Victor, Los Quetzales, Vulture Rock, Cloudbridge North and South connector
	26, 25, 24, 22	12	Don Victor, Los Quetzales, Vulture Rock, Cloudbridge North and South connector
El Jilguero	30, 27, 28, 33, 12	13	El Jilguero, Chirripó
	12, 33, 28, 27, 30	14	El Jilguero, road to San Gerardo

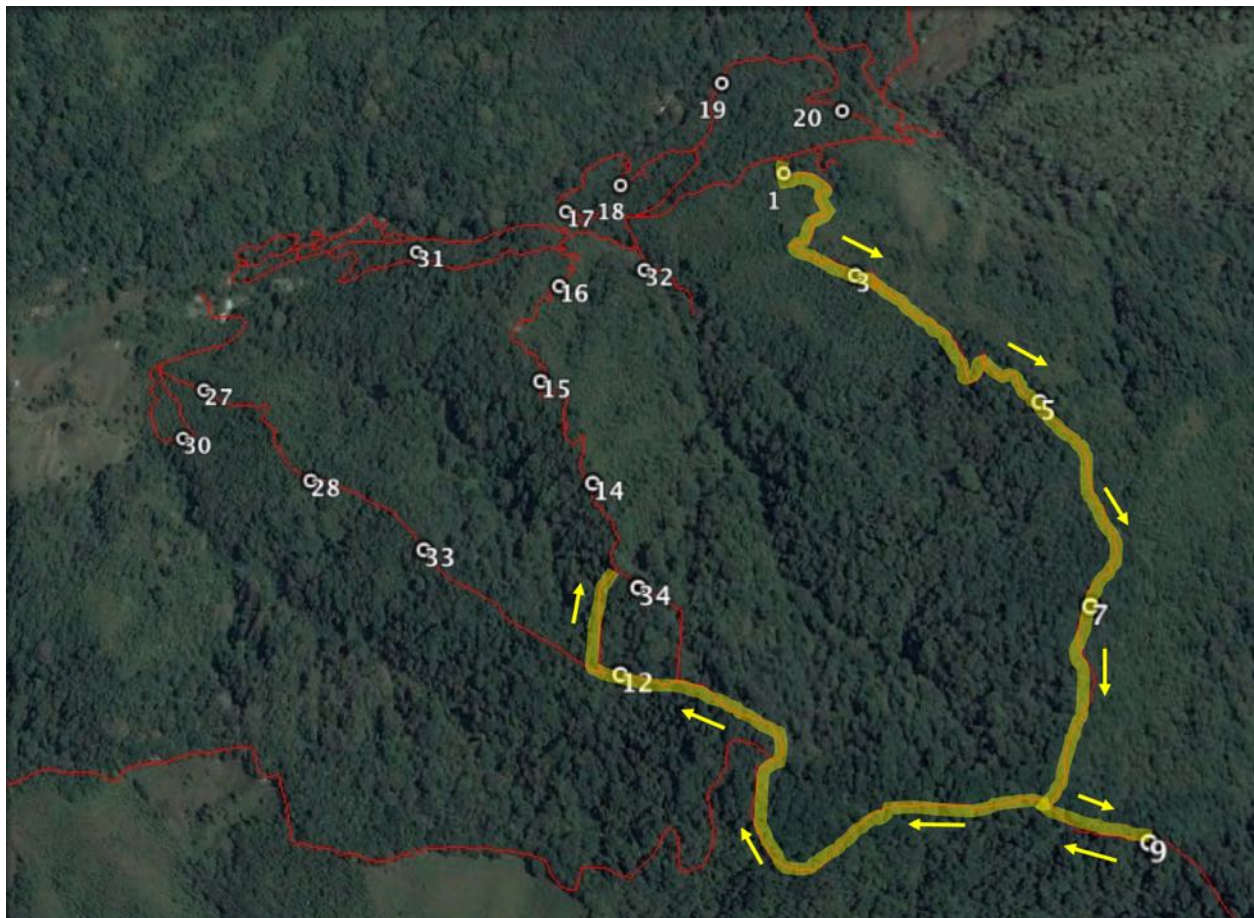


FIGURE 6: Montaña and Chirripó Walking Survey From Station 1.

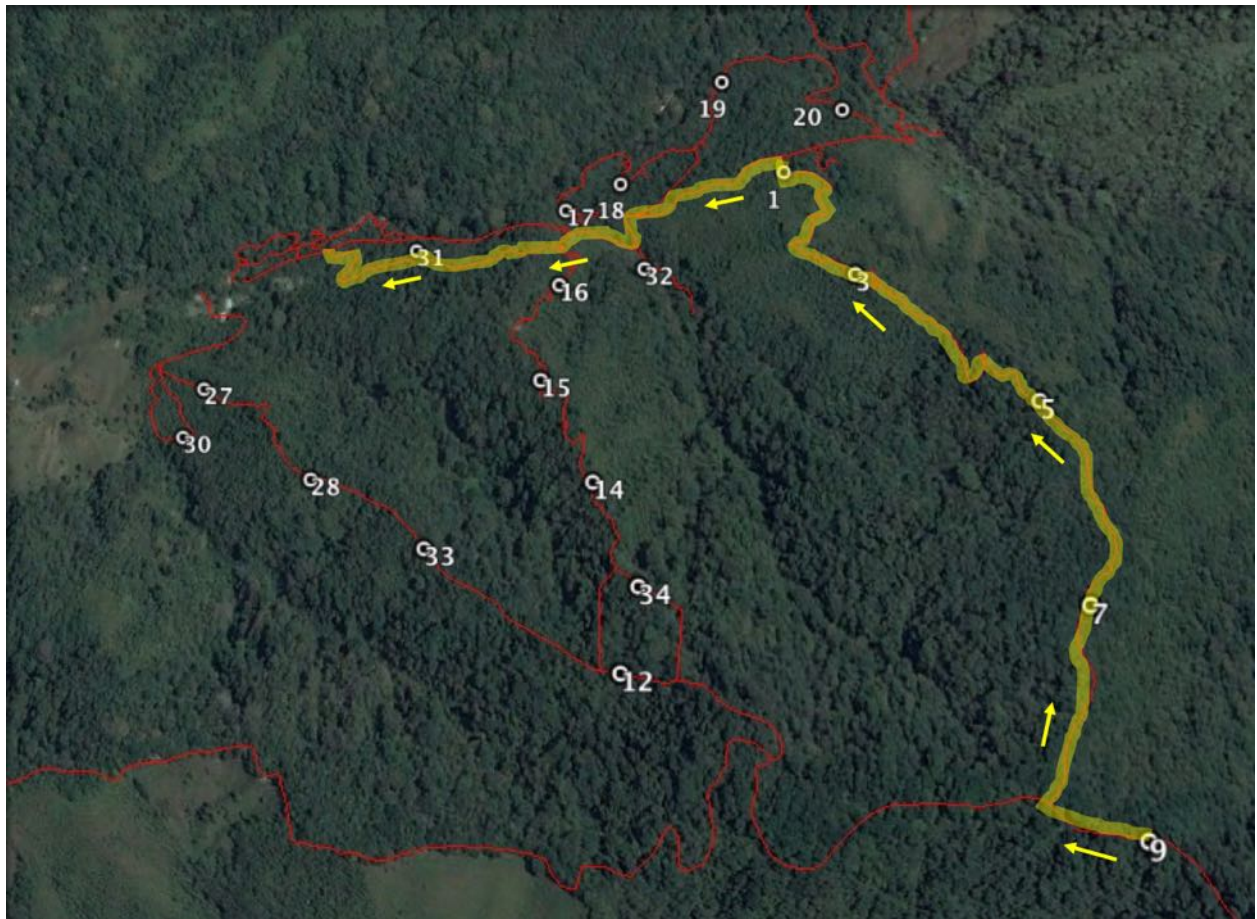


FIGURE 7: Montaña and Chirripó Walking Survey From Station 9.



FIGURE 8: Sentinel & Gavilan Walking Survey From Station 32.

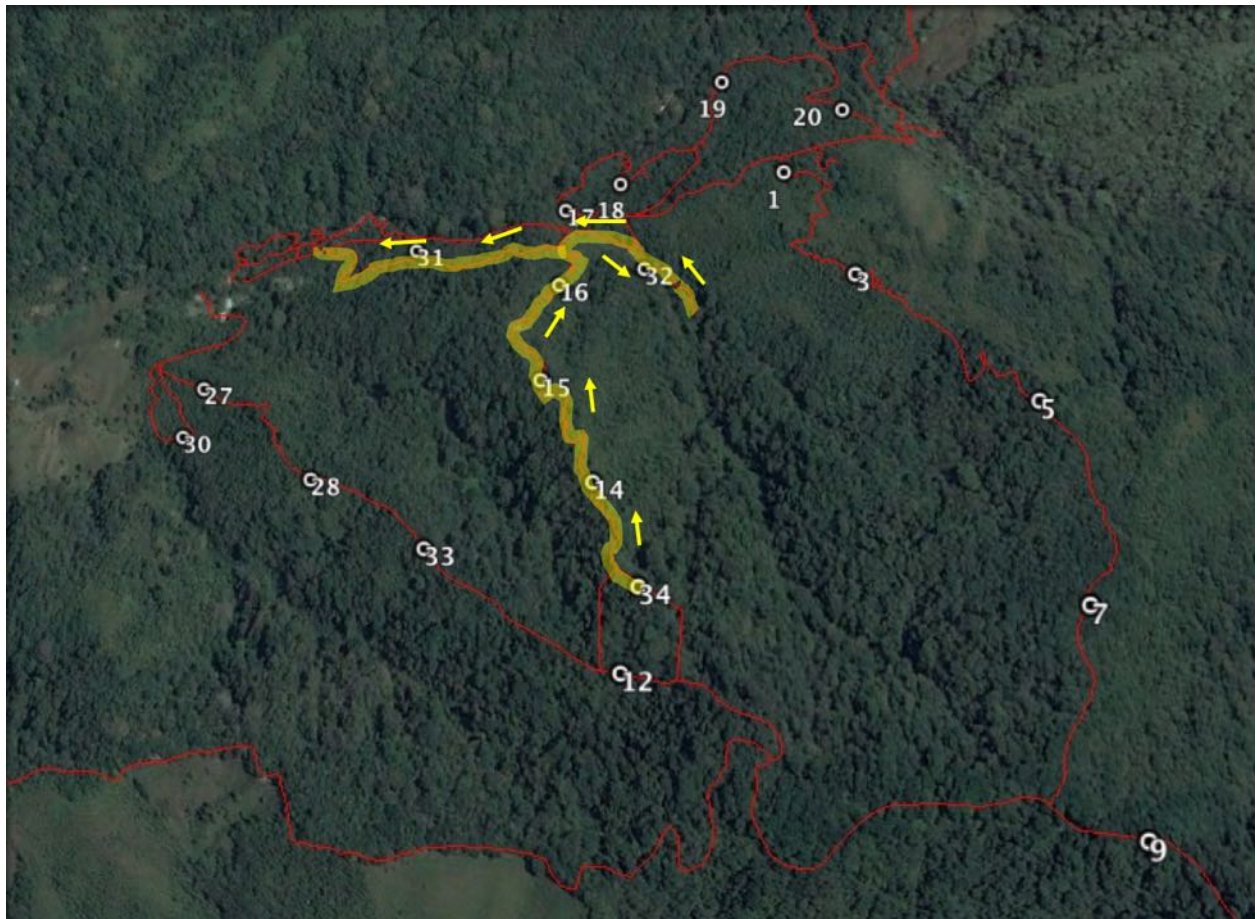


FIGURE 9: Sentinel & Gavilan Walking Survey From Station 34.

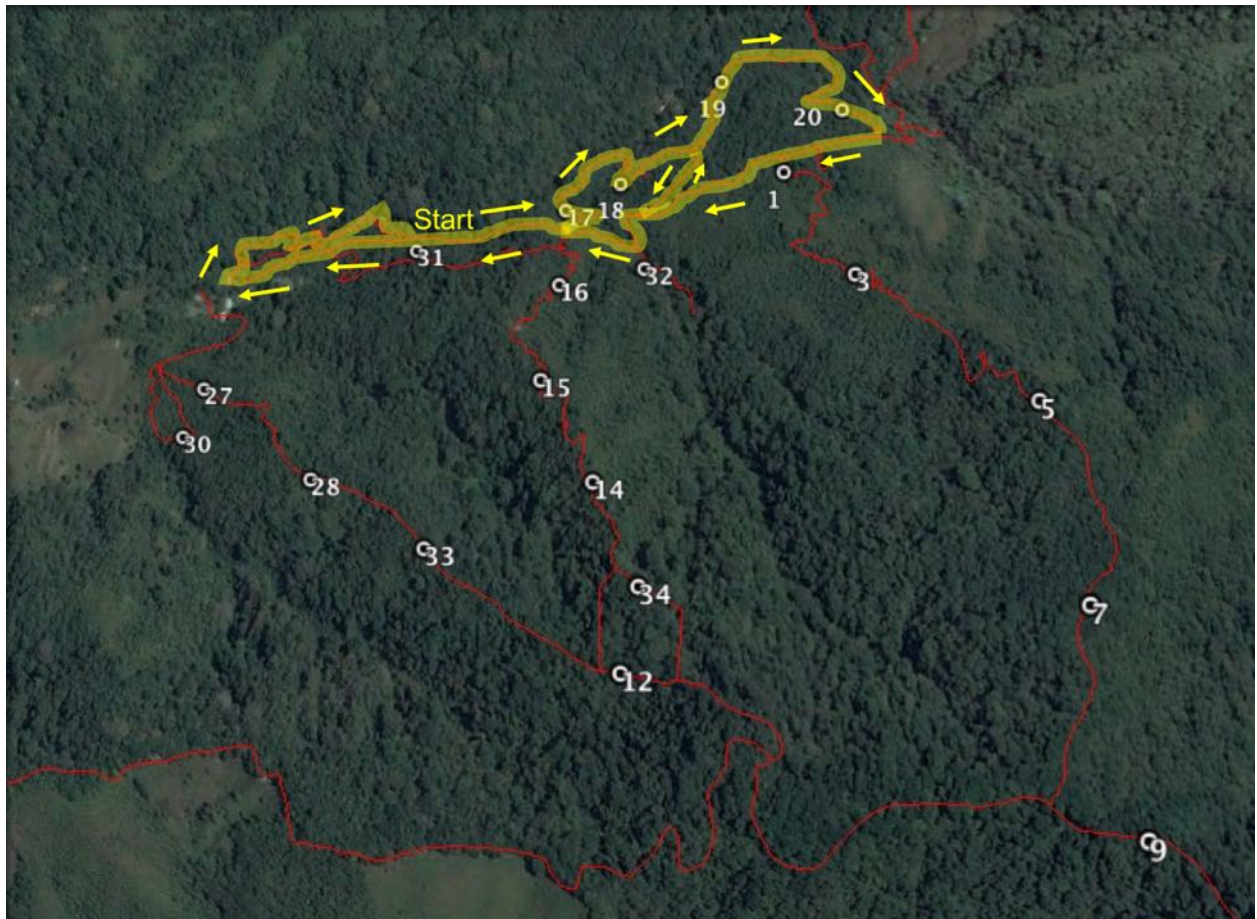


FIGURE 10: Principal & Rio Walking Survey From Station 31.

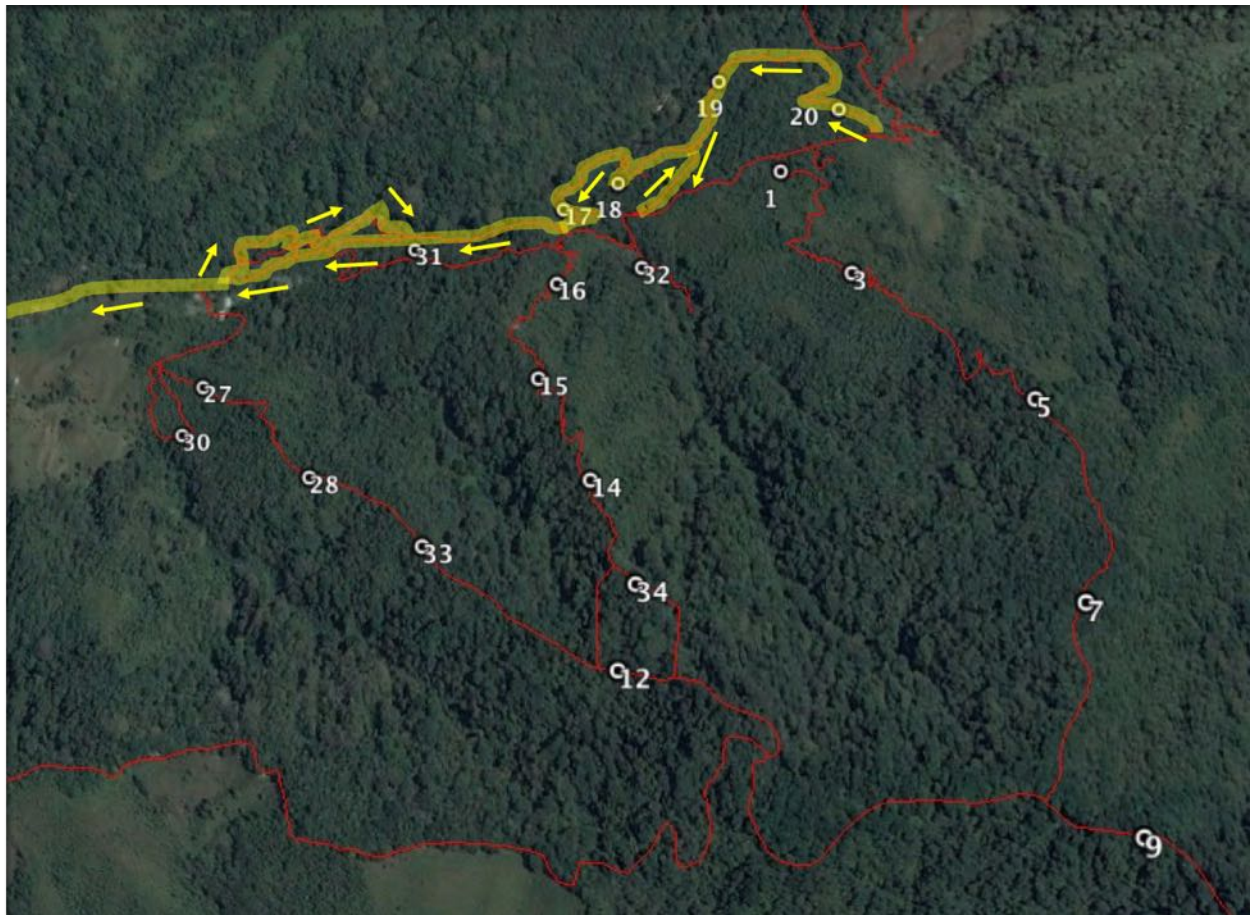


FIGURE 11: Rio & Principal Walking Survey From Station 20.

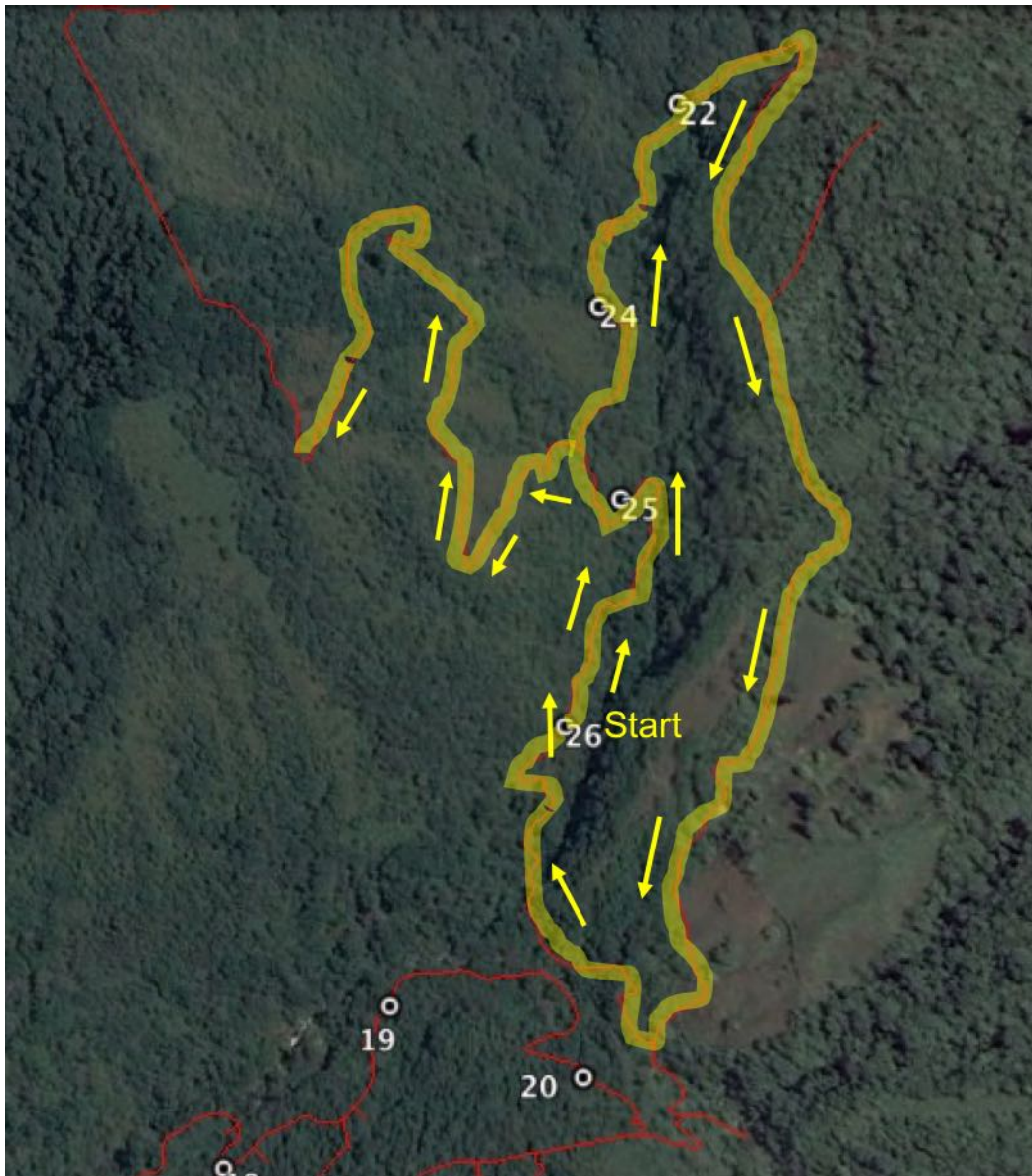


FIGURE 12: Don Victor Walking Survey From Station 26.

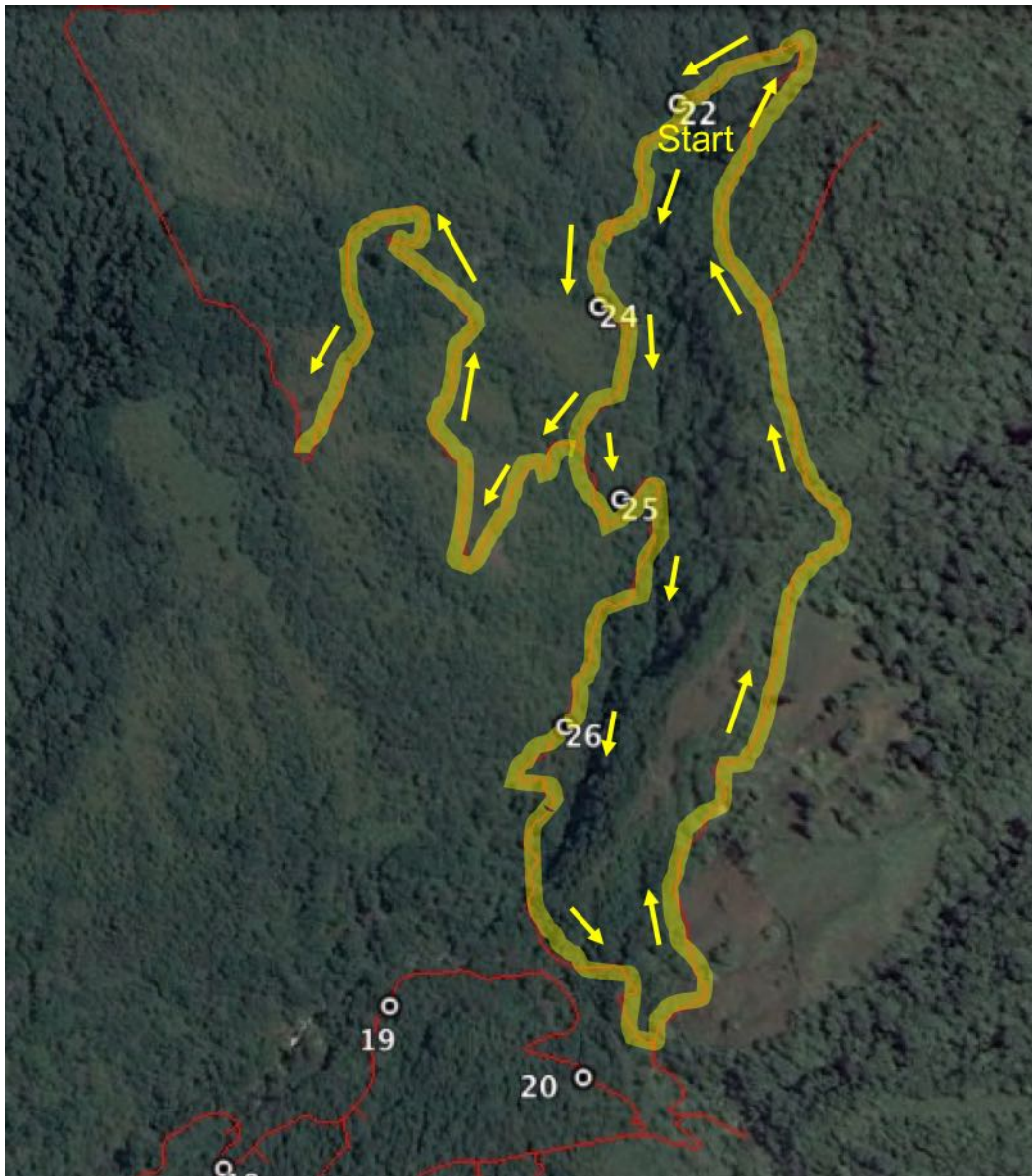


FIGURE 13: Don Victor Walking Survey From Station 22.

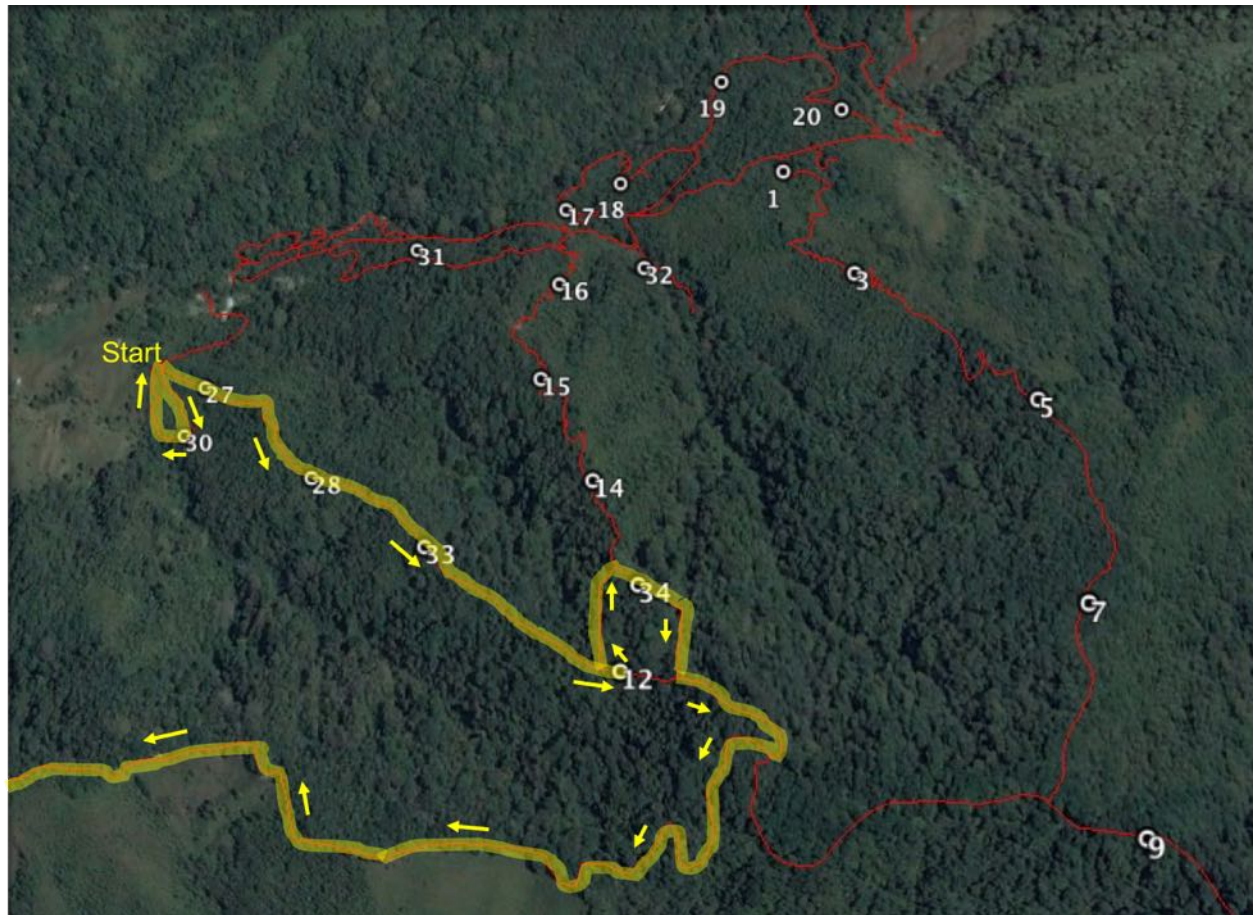


FIGURE 14: El Jilguero Walking Survey From Station 30.

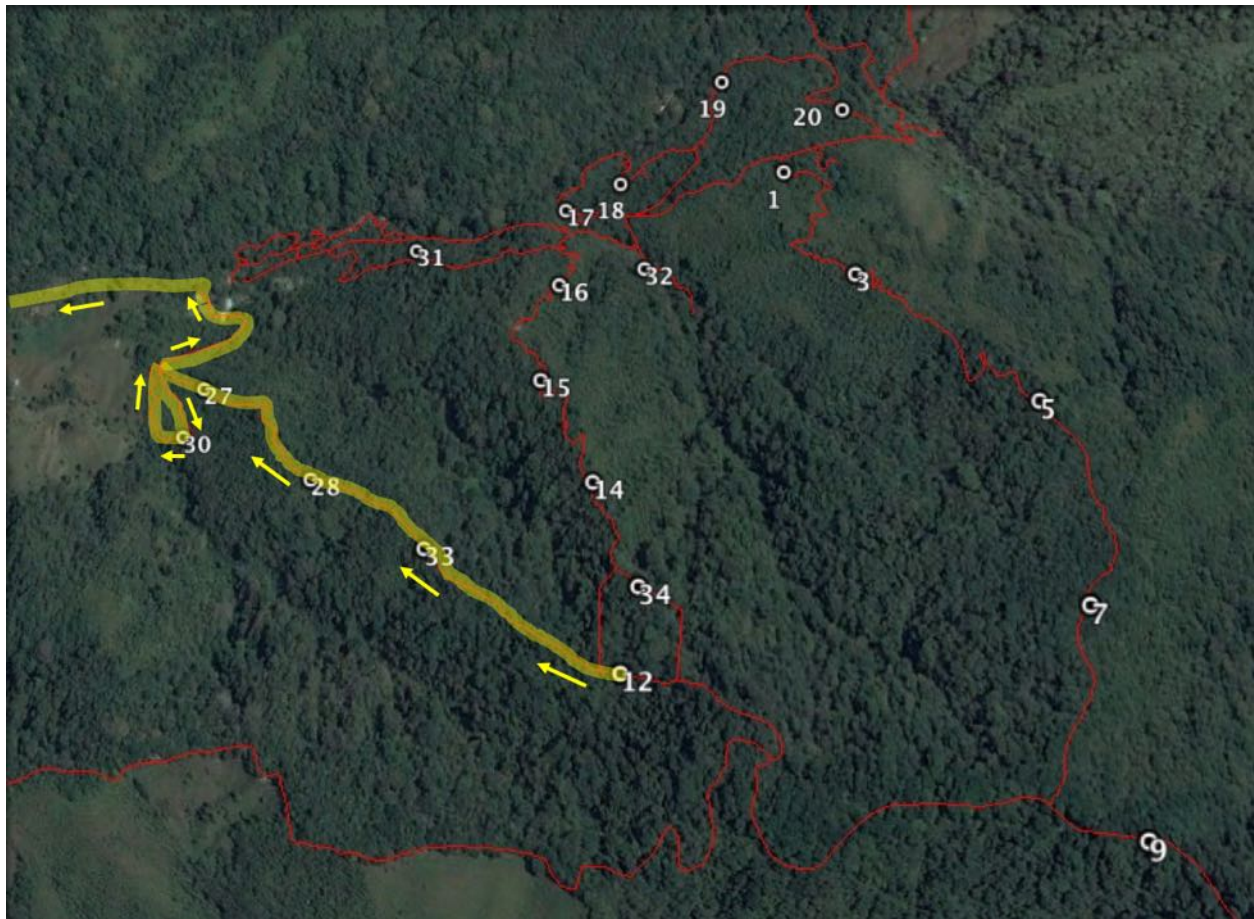


FIGURE 15: El Jilguero Walking Survey From Station 12.

3.1.4.2 DATA COLLECTION

Starting in September 2016, 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 were recorded. If major changes in weather occurred during the survey, these were 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.

3.1.4.3 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.

3.2 HISTORIC METHODS

The methods described in this section were in effect prior to March 2016. Current methods are described in Section 3.1.

3.2.1 TRAINING

The current training regime described in Section 3.1.1 was initiated in January 2016. Prior to that, with one exception, the bird research interns received general training in Costa Rican bird identification through Global Vision International (GVI) for three months before arriving at Cloudbridge. However, they were not required to pass a bird identification test at Cloudbridge prior to beginning point count surveys.

3.2.2 SURVEY TIMING

Survey timing between January 2013 and December 2015 was irregular. The stations being surveyed varied between research interns, surveys occurred at irregular intervals, and all stations were not surveyed the same number of times. Starting in January 2016, the stations being surveyed were consistent and each station was surveyed the same number of times per group of research interns, with a few exceptions. Tables showing the number of surveys conducted at each station and habitat type for 2016 (Tables 11 and 12), 2015 (Tables 13 and 14), 2014 (Tables 15 and 16), and 2013 (Tables 17 and 18) are provided below.

3.2.3 POINT COUNTS

Between January 2013 and March 2016, prior to the beginning of each point count, the rain, wind, and percent cloud cover were recorded. General descriptions instead of weather classes were used. When this data was entered into the current point count database, the weather descriptions were converted to weather classes whenever possible.

Between January 2013 and December 2015, at each station, the start time was recorded and birds seen or heard within or outside the survey area within the following 20 minutes were recorded. Differing from the current methodology, if birds could not be identified with 100% certainty to species, they were not recorded. Like the current methodology, within the 20 minutes, the presence of individual birds was broken into 5 different intervals: 0-2 mins, 2-5 mins, 5-10 mins, 10-15 mins, and 15-20 mins to allow comparability with other bird studies of other durations. However, unlike the current methodology, only the first interval a bird was identified in was recorded. The surveys conducted from January 2016 onward follow the current methodology in regards recording bird species and presence in time intervals.

The survey area used for historical point counts, as well as the criteria for which birds were 'inside' or 'outside' the survey area, were the same as the current study (see Section 3.1.3). Additional information that was sometimes noted for the recorded birds included: sex (male, female, or unknown), and age class (juvenile or adult).

3.2.4 WALKING SURVEYS

Walking surveys were initiated in January 2016. Between January and August, 2016, they were conducted once or twice a month, with each group of interns conducting 4 or 5. Walking surveys were conducted on weekends for between 7-8 hours, starting at 6:00 am. Where the surveys were conducted was up to the interns, although attempts were made to cover all trails within the reserve, in particular areas not covered by the point counts. Sometimes local bird watchers and Cloudbridge staff would join in.

A list of bird species seen during the surveys was recorded and the number of each species seen throughout the survey tallied. Results were not initially recorded in a Cloudbridge database, but uploaded to eBird (www.ebird.org), a citizen science bird database run by Cornell Lab of Ornithology.

Starting in September 2016, additional data started being collected for walking surveys, including start and end time, survey route, and starting and ending weather conditions. This data, along with the species lists and tallies, also started being recorded in an excel database.

TABLE 11: Number of Point Counts Per Month – 2016

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1*	1	3	4	4	2			5	2	4	4		29
3*	1	3	4	4	2			5	2	4	4		29
5*	1	3	4	4	2			5	2	4	4		29
7*	1	3	4	4	2			5	2	4	4		29
9*	1	3	4	4	2			5	2	4	4		29
12*	1	4	3	4	2			6	2	3	5		30
13	1	4											5
14*	1	4	3	4	2			5	2	3	5		29
15*	1	4	3	4	2			5	2	3	5		29
16*	1	4	3	4	2			5	2	3	5		29
17*	2	3	2	5	2			4	3	3	4		28
18*	2	3	2	5	2			4	3	3	4		28
19*	2	3	2	5	2			4	3	3	4		28
20*	2	3	2	5	2			4	3	3	4		28
22*	1	4	3	4	3			4	3	3	3	1	29
24*	1	4	3	4	2			4	3	3	3	1	28
25*	1	4	3	4	2			4	3	3	3	1	28
26*	1	4	3	4	2			4	3	3	3	1	28
27*	1	4	3	4	2			5	2	3	5		29
28*	1	4	3	4	2			5	2	3	5		29
29	1	4											5
30*	1	4	3	4	-			5	2	3	5		27
31*	2	3	2	5	2			4	3	3	4		28
32*	1	4	3	4	2			5	2	3	5		29
33*			3	4	2			4	2	3	5		23
34*			3	4	2			4	2	3	5		23
Total	29	86	72	101	47	0	0	110	57	77	102	4	685

-, Station 30 was not surveyed in May as the surveyors could not find the bird station marker. *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 12: Number of Point Counts Per Habitat Type – 2016

Habitat	# Stations	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
P	6	6	22	20	24	10	30	12	20	28		172
P/NR<30	3	5	10	7	14	6	13	8	9	13		85
NR<30	10	13	35	29	43	21	43	27	32	37	4	284
NR>30	1	1	4	3	4	2	5	2	3	5		29
NR±30	2	1	4	3	4	2	4	2	3	5		28
OG	4	3	11	10	12	6	15	6	10	14		87
Total	26	29	86	72	101	47	110	57	77	102	4	685

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.

TABLE 13: Number of Point Counts Per Month – 2015

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1*	2	1		1		2							6
2		1		1		2							4
3*	2			1		2							5
4		1		1		2							4
5*	2					1							3
6		1	1			1							3
7*	2		1			1							4
9*	2	1	2		1	1							7
10	2	1	2		1	1							7
11	2	2	2		1	1							8
12*			1		2	1							4
13	1	2	1	1		2							7
14*	1	2	1	1		2							7
15*	1	2	1	1		2							7
16*	1	2	1	1		2							7
17*	3	2	1	1	1	1							9
18*	3	1	1	1	1	1							8
19*	3	1	1	1	1	1							8
20*	3	1			1	1							6
22*	1	2	2		1	2							8
24*	1	2	2		1	2							8
25*	1	2	2		1	2							8
26*	1	2	2		1	2							8
27*	2	1	1		1	1							6
28*	2	1	1		1	1							6
29	2	1	1		2	1							7
30*	2	1											3
31*	3	1	1	1	1	1							8
32*	3	1		1									5
Total	48	35	28	13	18	39	0	0	0	0	0	0	181

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 14: Number of Point Counts Per Habitat Type – 2015

Habitat	# Stations	Jan	Feb	Mar	Apr	May	Jun	Total
P	7	12	7	2	5	1	9	36
P/NR<30	4	7	5	2	3	2	6	25
NR<30	11	19	14	14	3	8	15	73
NR>30	1	1	2	1	1		2	7
NR±30	1	2	1	1		2	1	7
OG	5	7	6	8	1	5	6	33
Total	29	48	35	28	13	18	39	181

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.

TABLE 15: Number of Point Counts Per Month – 2014

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1*	1	3			2	1				1	2		10
2										1	2		3
3*		3			2	1				1	1		8
4	1									1	2		4
5*	1	2				1				1	2		7
6										1	3		4
7*		2			1	1					2		6
8		2			2	1					2		7
9*		2									1		3
10		2									1		3
11	1	2									1		4
12*	1	3								1			5
13		3				2				1			6
14*	1	3				2				1			7
15*	1	4				2				1			8
16*	1	3			2	2				1			9
17*	3	2			1	1				1	3		11
18*	3	2			1	1				1	3		11
19*	3	2				1				1	2		9
20*	3	2				1				1	3		10
22*	1	2								1	3		7
24*	2	2								1	4		9
25*	2	2			1					1	4		10
26*	2	2			3					1	4		12
27*	1	3			1	1				1			7
28*	1	3			1	1						1	7
29	1	3				1				1			6
30*	1	3								1		1	6
31*	2	2		1	2	1							8
32*	2	2			1	1							6
Total	35	66	0	1	20	22	0	0	0	22	45	2	213

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 16: Number of Point Counts Per Habitat Type – 2014

Habitat	# Stations	Jan	Feb	Apr	May	Jun	Oct	Nov	Dec	Total
P	7	6	18		6	6	6	5	1	55
P/NR<30	4	8	7		3	4	4	8		38
NR<30	11	17	21	1	9	6	8	27	1	101
NR>30	1	1	3			2	1			8
NR±30	1	1	3			1	1			7
OG	6	2	14		2	3	2	5		34
Total	30	35	66	1	20	22	22	45	2	243

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.

TABLE 17: Number of Point Counts Per Station – 2013

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1*		1			1		1	3			1		7
3*		2			1		1	3		1			8
4										1	1		2
5*		1	1		1		1	3		1			8
6											1		1
7*		1	1		1		1	3			1		8
8		1			2		1	3					7
9*											1		1
10											2		2
11		1			1						2		4
12*		1	1		1						1		4
13		1			1		1	2	2		2	1	10
14*		1	1		1		1	2	2		2	1	11
15*		1					1	2	2		2	1	9
16*		1	1		1		1	2	2		2	1	11
17*							1	3	1		2		7
18*		1	1		1		1	3	1	1	2		11
19*							1	3	1	1	2		8
20*		1					1	3	1		2		8
22*		1	1					3	1			1	7
24*		1	1					3	1		1	1	8
25*		2						3	1		1	1	8
26*		2						3	1		1	1	8
27*							1	3			1		5
28*							1	3			1		5
29							1	3					4
30*								4			2		6
31*								3	1		1		5
32*								3	1				4
D		1	1										2
G	1												1
H	1												1
I	1												1
Total	3	21	9	0	12	0	16	66	18	5	34	8	190

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 18: Number of Point Counts Per Habitat Type – 2013

Habitat	# Stations	Feb	Mar	May	Jul	Aug	Sep	Oct	Nov	Dec	Total
P	6	4		2	4	18	3	1	6	1	45
P/NR<30	4	3	2	2	3	8	4	2	7	1	36
NR<30	11	8	4	2	5	30	7	2	11	4	84
NR>30	1	1	1	1	1	2	2		2	1	12
NR±30	1				1	3					5
OG	6	4	1	5	2	5	2		8	1	34
Total	29	20	8	12	16	66	18	5	34	8	216

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.

4 DATA SUMMARY

4.1 2016

4.1.1 SPECIES IDENTIFIED

Overall, 186 unique bird species were identified during point count and walking surveys in 2016 (Table 19). Point counts found 163 species, 155 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: Silvery-fronted Tapaculo (*Scytalopus argentifrons*), Brown Jay (*Psilorhinus morio*), and Scaly-breasted Wren (*Microcerculus marginatus*). There were also 5 species only identified outside of the survey area during point counts: Turkey Vulture (*Cathartes aura*), Ornate Hawk-Eagle (*Spizaetus ornatus*), Red-tailed Hawk (*Buteo jamaicensis*), Red-fronted Parrotlet (*Touit costaricensis*), and White-crowned Parrot (*Pionus senilis*).

Walking surveys found 137 species. Of those, 21 were only identified during walking surveys and not during point counts (Table 19).

4.1.1.1 THREATENED SPECIES

Seven (7) species on the IUCN Redlist of Threatened Species (www.iucnredlist.org) were identified during the survey period (Table 19). Of these, 2 species are considered Vulnerable (VU): Ruddy Pigeon (*Patagioenas subvinacea*) and Red-fronted Parrotlet. The other 5 are considered Near Threatened (NT): Black Guan (*Chamaepetes unicolor*), Ornate Hawk-Eagle, Resplendent Quetzal (*Pharomachrus mocinno*), Olive-sided Flycatcher (*Contopus cooperi*), and Golden-winged Warbler (*Vermivora chrysoptera*). One species, Streaked Xenops (*Xenops rutilans*), has not yet been assessed.

TABLE 19: Bird Species Identified, All Methods – 2016

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			x	
Gray-headed Chachalaca	<i>Ortalis cinereiceps</i>	LC				x	x
Odontophoridae							
Spotted Wood-Quail	<i>Odontophorus guttatus</i>	LC	x			x	
Cathartidae							
Black Vulture	<i>Coragyps atratus</i>	LC				x	x
Turkey Vulture	<i>Cathartes aura</i>	LC			x	x	
Accipitridae							
Ornate Hawk-Eagle	<i>Spizaetus ornatus</i>	NT			x		
Red-tailed Hawk	<i>Buteo jamaicensis</i>	LC			x		
Falconidae							
Bat Falcon	<i>Falco rufigularis</i>	LC	x				
Apodidae							
White-collared Swift	<i>Streptoprocne zonaris</i>	LC				x	x
Trochilidae							
Bronzy Hermit	<i>Glaucis aeneus</i>	LC	x				
Brown Violetear	<i>Colibri delphinae</i>	LC	x				
Fiery-throated Hummingbird	<i>Panterpe insignis</i>	LC	x				
Green Hermit	<i>Phaethornis guy</i>	LC	x			x	
Green-crowned Brilliant	<i>Heliodoxa jacula</i>	LC	x			x	
Green-fronted Lancebill	<i>Doryfera ludovicae</i>	LC	x			x	
Lesser Violetear	<i>Colibri cyanotus</i>	LC	x			x	
Long-Billed Hermit	<i>Phaethornis longirostris</i>	LC	x				
Magenta-throated Woodstar	<i>Calliphlox bryantae</i>	LC	x			x	
Purple-crowned Fairy	<i>Heliothryx barroti</i>	LC	x			x	
Rivoli's Hummingbird ⁷	<i>Eugenes fulgens</i>	LC	x			x	
Rufous-tailed Hummingbird	<i>Amazilia tzacatl</i>	LC	x			x	
Scintillant Hummingbird	<i>Selasphorus scintilla</i>	LC	x			x	
Snowy-bellied Hummingbird	<i>Amazilia edward</i>	LC	x			x	
Stripe-tailed Hummingbird	<i>Eupherusa eximia</i>	LC	x			x	
Violet Sabrewing	<i>Camplyopterus hemileucurus</i>	LC	x			x	
violet-headed hummingbird	<i>Klais guimeti</i>	LC	x			x	
Volcano Hummingbird	<i>Selasphorus flammula</i>	LC	x				
White-necked Jacobin	<i>Florisuga mellivora</i>	LC	x				
White-tailed Emerald	<i>Elvira chionura</i>	LC	x				
White-throated Mountain-gem	<i>Lampornis castaneiventris</i>	LC	x			x	
Columbidae							
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	LC	x				
Chiriqui Quail-Dove	<i>Zentrygon chiriquensis</i>	LC	x			x	
Ruddy Ground-Dove	<i>Columbina talpacoti</i>	LC	x				
Ruddy Pigeon	<i>Patagioenas subvinacea</i>	VU	x			x	
White-tipped Dove	<i>Leptotila verreauxi</i>	LC	x			x	
Psittacidae							
Red-fronted Parrotlet	<i>Touit costaricensis</i>	VU			x	x	
Sulphur-winged Parakeet	<i>Pyrrhura boffmanni</i>	LC	x			x	
White-crowned Parrot	<i>Pionus senilis</i>	LC			x	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
Cuculidae							
Squirrel Cuckoo	<i>Piaya cayana</i>	LC	x			x	
Trogonidae							
Collared Trogon	<i>Trogon collaris</i>	LC	x			x	
Resplendent Quetzal	<i>Pharomachrus mocinno</i>	NT	x			x	
Momotidae							
Lesson's Motmot	<i>Momotus lessonii</i>	LC	x			x	
Capitonidae							
Red-headed Barbet	<i>Eubucco bourcierri</i>	LC	x			x	
Ramphastidae							
Northern Emerald-Toucanet	<i>Aulacorhynchus prasinus</i>	LC	x			x	
Picidae							
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	LC	x				
Golden-olive Woodpecker	<i>Colaptes rubiginosus</i>	LC	x			x	
Hairy Woodpecker	<i>Picoides villosus</i>	LC	x			x	
Red-crowned Woodpecker	<i>Melanerpes rubricapillus</i>	LC				x	x
Smoky-brown Woodpecker	<i>Picoides fumigatus</i>	LC	x				
Furnariidae							
Brown-billed Scythebill	<i>Campylorhynchus pusillus</i>	LC				x	x
Buff-fronted Foliage-gleaner	<i>Philydor rufum</i>	LC	x				
Buff-throated Foliage-gleaner	<i>Automolus ochrolaemus</i>	LC	x				
Buffy Tuftedcheek	<i>Pseudocolaptes lawrencii</i>	LC	x			x	
Lineated Foliage-gleaner	<i>Syndactyla subalaris</i>	LC	x			x	
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>	LC	x			x	
Plain Xenops	<i>Xenops minutus</i>	LC	x			x	
Red-faced Spinetail	<i>Craniolenca erythroptis</i>	LC	x			x	
Ruddy Treerunner	<i>Margarornis rubiginosus</i>	LC				x	x
Spot-crowned Woodcreeper	<i>Lepidocolaptes affinis</i>	LC	x			x	
Spotted Barbtail	<i>Premnoplex brunnescens</i>	LC	x			x	
Spotted Woodcreeper	<i>Xiphorhynchus erythropygius</i>	LC	x			x	
Streak-breasted Treehunter	<i>Thripadectes rufobrunneus</i>	LC	x				
Streak-headed Woodcreeper	<i>Lepidocolaptes souleyetii</i>	LC	x			x	
Streaked Xenops	<i>Xenops rutilans</i>	NA				x	x
Wedge-billed Woodcreeper	<i>Glyphorhynchus spirurus</i>	LC	x				
Thamnophilidae							
Slaty Antwren	<i>Myrmotherula schisticolor</i>	LC	x				
Rhinocryptidae							
Silvery-fronted Tapaculo	<i>Scytalopus argentifrons</i>	LC		x		x	
Tyrannidae							
Black Phoebe	<i>Sayornis nigricans</i>	LC	x			x	
Black-capped Flycatcher	<i>Empidonax atriceps</i>	LC	x			x	
Boat-billed Flycatcher	<i>Megarhynchus pitangua</i>	LC	x			x	
Bright-rumped Attila	<i>Attila spadiceus</i>	LC	x				
Common Tody-flycatcher	<i>Todirostrum cinereum</i>	LC				x	x
Dark Pewee	<i>Contopus lugubris</i>	LC	x			x	
Dusky-capped Flycatcher	<i>Myiarchus tuberculifer</i>	LC	x			x	
Eye-ringed Flatbill	<i>Rhynchocyclus brevirostris</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
Tyrannidae (cont'd)							
Golden-bellied Flycatcher	Myiodynastes hemichrysus	LC	x			x	
Gray-capped Flycatcher	Myiozetetes granadensis	LC				x	x
Great Kiskadee	Pitangus sulphuratus	LC	x			x	
Least Flycatcher	Empidonax minimus	LC	x				
Lesser Elaenia	Elaenia chiriquensis	LC				x	x
Mountain Elaenia	Elaenia frantzii	LC	x				
Ochraceous Pewee	Contopus ochraceus	LC				x	x
Olive-sided Flycatcher	Contopus cooperi	NT	x				
Olive-striped Flycatcher	Mionectes olivaceus	LC	x			x	
Paltry Tyrannulet	Zimmerius vilissimus	LC	x			x	
Rough-legged Tyrannulet	Phyllomyias burmeisteri	LC	x				
Scale-crested Pygmy-tyrant	Lophotriccus pileatus	LC				x	x
Slaty-capped Flycatcher	Leptopogon superciliaris	LC	x			x	
Torrent Tyrannulet	Serpophaga cinerea	LC				x	x
Tropical Kingbird	Tyrannus melancholicus	LC	x			x	
Tropical Pewee	Contopus cinereus	LC	x			x	
Tufted Flycatcher	Mitrephanes phaeocercus	LC	x			x	
Western Wood-pewee	Contopus sordidulus	LC	x			x	
Yellow-bellied Flycatcher	Empidonax flaviventris	LC	x			x	
Yellowish Flycatcher	Empidonax flavescens	LC	x			x	
Tityridae							
Barred Becard	Pachyramphus versicolor	LC	x			x	
Black-and-white Becard	Pachyramphus albobrisatus	LC	x			x	
Masked Tityra	Tityra semifasciata	LC	x			x	
Corvidae							
Brown Jay	Psilorbhynchus morio	LC		x		x	
Turdidae							
Black-billed Nightingale-Thrush	Catharus gracilirostris	LC	x			x	
Black-faced Solitaire	Myadestes melanops	LC	x			x	
Clay-colored Thrush	Turdus grayi	LC	x			x	
Mountain Thrush	Turdus plebejus	LC	x			x	
Orange-billed Nightingale-Thrush	Catharus aurantirostris	LC	x			x	
Ruddy-capped Nightingale-Thrush	Catharus frantzii	LC	x			x	
Slaty-backed Nightingale-thrush	Catharus fuscater	LC	x				
Sooty Thrush	Turdus nigrescens	LC	x			x	
Swainson's Thrush	Catharus ustulatus	LC	x			x	
White-throated Thrush	Turdus assimilis	LC	x				
Cinclidae							
American Dipper	Cinclus mexicanus	LC	x			x	
Ptilogonatidae							
Black-and-yellow Silky-flycatcher	Phainoptila melanocephala	LC	x				
Long-tailed Silky-flycatcher	Ptilogonys caudatus	LC	x			x	
Troglodytidae							
Gray-breasted Wood-Wren	Henicorbina leucophrys	LC	x			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
<i>Troglodytidae (cont'd)</i>							
House Wren	<i>Troglodytes aedon</i>	LC	x			x	
Isthmian Wren	<i>Cantorchilus elutus</i>	LC	x				
Ochraceous Wren	<i>Troglodytes ochraceus</i>	LC	x				
Rufous-breasted Wren	<i>Pheugopedius rutilus</i>	LC	x			x	
Scaly-breasted Wren	<i>Microcerculus marginatus</i>	LC		x		x	
White-breasted Wood-Wren	<i>Henicorbina leucosticta</i>	LC	x			x	
<i>Vireonidae</i>							
Brown-capped Vireo	<i>Vireo leucophrys</i>	LC	x			x	
Lesser Greenlet	<i>Hylophilus decurtatus</i>	LC	x				
Philadelphia Vireo	<i>Vireo philadelphicus</i>	LC	x			x	
Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	LC	x				
Yellow-throated Vireo	<i>Vireo flavifrons</i>	LC	x			x	
Yellow-winged Vireo	<i>Vireo carmioli</i>	LC	x				
<i>Parulidae</i>							
Black-and-white Warbler	<i>Mniotilta varia</i>	LC	x			x	
Black-cheeked Warbler	<i>Basileuterus melanogenys</i>	LC	x			x	
Black-throated Green Warbler	<i>Setophaga virens</i>	LC	x			x	
Blackburnian Warbler	<i>Setophaga fusca</i>	LC	x			x	
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	LC				x	x
Collared Redstart	<i>Myioborus torquatus</i>	LC	x			x	
Costa Rican Warbler	<i>Basileuterus melanotis</i>	LC	x			x	
Flame-throated Warbler	<i>Oreothlypis gutturalis</i>	LC	x			x	
Golden-crowned Warbler	<i>Basileuterus culicivorus</i>	LC	x			x	
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	NT	x			x	
Kentucky Warbler	<i>Geothlypis formosa</i>	LC				x	x
Prothonotary Warbler	<i>Protonotaria citrea</i>	LC	x				
Rufous-Capped Warbler	<i>Basileuterus rufifrons</i>	LC				x	x
Slate-throated Redstart	<i>Myioborus miniatus</i>	LC	x			x	
Tennessee Warbler	<i>Oreothlypis peregrina</i>	LC	x			x	
Townsend's Warbler	<i>Setophaga townsendi</i>	LC	x			x	
Tropical Parula	<i>Setophaga pitiayumi</i>	LC	x			x	
Wilson's Warbler	<i>Cardellina pusilla</i>	LC	x			x	
Worm-eating Warbler	<i>Helmitheros vermivorum</i>	LC	x				
Wrenthrush	<i>Zeledonia coronata</i>	LC	x			x	
Yellow-rumped Warbler	<i>Setophaga coronata</i>	LC	x				
Yellow-throated Warbler	<i>Setophaga dominica</i>	LC	x				
<i>Thraupidae</i>							
Bananaquit	<i>Coereba flaveola</i>	LC				x	x
Bay-headed Tanager	<i>Tangara gyrola</i>	LC	x			x	
Blue-gray Tanager	<i>Thraupis episcopus</i>	LC	x				
Buff-throated Saltator	<i>Saltator maximus</i>	LC	x			x	
Cherrie's Tanager	<i>Ramphocelus costaricensis</i>	LC	x			x	
Golden-hooded Tanager	<i>Tangara larvata</i>	LC				x	x
Gray-headed Tanager	<i>Eucometis penicillata</i>	LC	x				
Palm Tanager	<i>Thraupis palmarum</i>	LC	x				
Peg-billed Finch	<i>Acanthidops bairdi</i>	LC	x				
Scarlet-thighed Dacnis	<i>Dacnis venusta</i>	LC	x			x	
Silver-throated Tanager	<i>Tangara icterocephala</i>	LC	x			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
<i>Thraupidae (cont'd)</i>							
Slaty Flowerpiercer	<i>Diglossa plumbea</i>	LC	x			x	
Spangle-cheeked Tanager	<i>Tangara dowii</i>	LC				x	x
Speckled Tanager	<i>Tangara guttata</i>	LC	x			x	
Streaked Saltator	<i>Saltator striatipectus</i>	LC	x				
Yellow-faced Grassquit	<i>Tiaris olivacea</i>	LC	x			x	
<i>Emberizidae</i>							
Black-striped Sparrow	<i>Arremonops conirostris</i>	LC				x	x
Chestnut-capped Brush-Finch	<i>Arremon brunneinucha</i>	LC	x			x	
Common Chlorospingus	<i>Chlorospingus flavopectus</i>	LC	x			x	
Rufous-collared Sparrow	<i>Zonotrichia capensis</i>	LC	x			x	
Sooty-capped Chlorospingus	<i>Chlorospingus pileatus</i>	LC	x			x	
White-naped Brushfinch	<i>Atlapietes albinucha</i>	LC	x			x	
Yellow-thighed Finch	<i>Pselliophorus tibialis</i>	LC	x			x	
<i>Cardinalidae</i>							
Blue Seedeater	<i>Amaurospiza concolor</i>	LC	x			x	
Flame-colored Tanager	<i>Piranga bidentata</i>	LC	x			x	
Hepatic Tanager	<i>Piranga flava</i>	LC	x			x	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	LC	x			x	
Scarlet Tanager	<i>Piranga olivacea</i>	LC	x				
Summer Tanager	<i>Pirangra rubra</i>	LC	x			x	
White-winged Tanager	<i>Piranga leucoptera</i>	LC	x			x	
<i>Icteridae</i>							
Baltimore Oriole	<i>Icterus galbula</i>	LC	x				
<i>Fringillidae</i>							
Elegant Euphonia	<i>Euphonia elegantissima</i>	LC	x			x	
Golden-browed Chlorophonia	<i>Chlorophonia callophrys</i>	LC	x			x	
Lesser Goldfinch	<i>Spinus psaltria</i>	LC	x				
Spot-crowned Euphonia	<i>Euphonia imitans</i>	LC	x				
White-vented Euphonia	<i>Euphonia minuta</i>	LC				x	x
Yellow-bellied Siskin	<i>Spinus xanthogastrus</i>	LC	x				
Total Species			157	3	5	137	21

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; 7, Magnificent Hummingbird prior to August 2017 (CLO 2017a).

4.1.3 ABUNDANCE

Station 30 was not surveyed in May, meaning only 23 stations were surveyed that month compared to 24 the other months. June and July were not surveyed in 2016.

Overall, 3570 birds were identified visually, inside the survey area during point counts in 2016 (Table 20) at an overall rate of 5.2 birds per point count (PC) (Table 21). The stations with the highest overall abundance were 20 (9.3/PC), 17 (8.7/PC), and 28 (8.2/PC). The stations with the lowest abundance were 34 (2.6/PC), and 12 and 27 (3.4/PC). The habitat type with the highest overall abundance was P/NR<30 at 7.7/PC, while the lowest was OG at 3.4/PC (Table 23). Raw abundance by habitat type is shown in Table 22. The months with the highest overall abundance were February (8.5/PC) and January (7.3/PC), while the lowest were May (2.9/PC) and October (3.4/PC) (Tables 21 and 23).

Overall in 2016, New World Warblers (*Parulidae spp.*) was the most abundant family (10.29/10 PC), with Hummingbirds (*Trochilidae spp.*) the second most abundant (7.18/10 PC) (Table 21). The most abundant families at each station are highlighted in Table 21, with the most abundant family in red text and the 2nd most abundant in blue text. New World Warblers were the most abundant family in all the habitats (Table 22). Hummingbirds were the second most abundant in P and NR<30. New World Sparrows and Allies (*Emberizidae spp.*) was the second most abundant family in P/NR<30, NR>30 and OG (tied with Ovenbirds (*Furnaridae spp.*) in OG). Barbets (*Capitonidae sp.*) was the 2nd most abundant family in NR±30.

Overall, the five most abundant species in 2016 were: Common Chlorospingus (*Chlorospingus flavopectus*) (4.72/10 PC), Slate-throated Redstart (*Myioborus miniatus*) (4.03/10 PC), Wilson's Warbler (*Cardellina pusilla*) (1.81/10 PC), Silver-throated Tanager (*Tangara icterocephala*) (1.80/10 PC), and Northern Emerald-Toucanet (*Aulacorhynchus prasinus*) (1.52/10 PC) (Table 25). The two most abundant species at each station are highlighted in Table 25, 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 24.

Generally, Common Chlorospingus and Slate-throated Redstart were the two most abundant species in each habitat type (Table 27). Common Chlorospingus was 1st and Slate-throated Redstart was 2nd in P/NR<30, NR<30, and OG, while Slate-throated Redstart was 1st and Common Chlorospingus 2nd in P. In NR>30, Northern Emerald-Toucanet and Slate-throated Redstart were 1st and Common Chlorospingus 2nd. In NR±30, Slate-throated Redstart was 1st and Red-headed Barbet (*Eubucco bourcierii*) 2nd.

TABLE 20: Raw Bird Abundance By Station - 2016

Station	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
1*	8	30	37	35	6	43	14	15	32		220
3*	9	24	26	22	3	9		10	8		111
5*	5	8	20	34	8	13	8	5	8		109
7*	8	21	40	17	2	13	2	8	11		122
9*	4	15	15	15	8	22	8	3	14		104
12*	3	18	5	23	3	17	6	10	16		102
13	3	30									33
14*	14	27	10	22	6	11	7	6	9		112
15*	12	20	15	31	9	11	8	2	18		126
16*	13	33	21	32	10	29	27	13	50		228
17*	24	43	13	56	7	36	7	19	39		244
18*	12	36	18	46	0	10	13	14	18		167
19*	3	21	4	22	7	4	19	11	18		109
20*	12	35	22	48	12	33	29	19	51		261
22*	2	27	12	15	5	9	4	11	18	6	109
24*	3	39	7	20	7	17	16	6	9	2	126
25*	8	45	18	19	5	14	8	6	12	3	138
26*	6	54	13	22	8	28	11	14	20	4	180
27*	7	22	11	18	1	8	3	16	12		98
28*	8	50	42	38	11	17	18	15	40		239
29	3	16									19
30*	12	41	10	16	-	16	5	15	37		152
31*	24	25	24	30	4	8	10	17	8		150
32*	9	55	12	30	8	21	7	6	16		164
33*			14	22	2	4	6	16	25		89
34*			4	17	2	15	5	8	8		59
Total	212	735	413	650	134	408	241	265	497	15	3570

NOTE: Includes only birds identified visually during surveys inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 21: Bird Abundance Per Point Count By Station - 2016

Station	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Overall	# Point Counts
1*	8.0	10.0	9.3	8.8	3.0	8.6	7.0	3.8	8.0		7.6	29
3*	9.0	8.0	6.5	5.5	1.5	1.8	0.0	2.5	2.0		3.8	29
5*	5.0	2.7	5.0	8.5	4.0	2.6	4.0	1.3	2.0		3.8	29
7*	8.0	7.0	10.0	4.3	1.0	2.6	1.0	2.0	2.8		4.2	29
9*	4.0	5.0	3.8	3.8	4.0	4.4	4.0	0.8	3.5		3.6	29
12*	3.0	4.5	1.7	5.8	1.5	2.8	3.0	3.3	3.2		3.4	30
13	3.0	7.5									6.6	5
14*	14.0	6.8	3.3	5.5	3.0	2.2	3.5	2.0	1.8		3.9	29
15*	12.0	5.0	5.0	7.8	4.5	2.2	4.0	0.7	3.6		4.3	29
16*	13.0	8.3	7.0	8.0	5.0	5.8	13.5	4.3	10.0		7.9	29
17*	12.0	14.3	6.5	11.2	3.5	9.0	2.3	6.3	9.8		8.7	28
18*	6.0	12.0	9.0	9.2	0.0	2.5	4.3	4.7	4.5		6.0	28
19*	1.5	7.0	2.0	4.4	3.5	1.0	6.3	3.7	4.5		3.9	28
20*	6.0	11.7	11.0	9.6	6.0	8.3	9.7	6.3	12.8		9.3	28
22*	2.0	6.8	4.0	3.8	1.7	2.3	1.3	3.7	6.0	6.0	3.8	29
24*	3.0	9.8	2.3	5.0	3.5	4.3	5.3	2.0	3.0	2.0	4.5	28
25*	8.0	11.3	6.0	4.8	2.5	3.5	2.7	2.0	4.0	3.0	4.9	28
26*	6.0	13.5	4.3	5.5	4.0	7.0	3.7	4.7	6.7	4.0	6.4	28
27*	7.0	5.5	3.7	4.5	0.5	1.6	1.5	5.3	2.4		3.4	29
28*	8.0	12.5	14.0	9.5	5.5	3.4	9.0	5.0	8.0		8.2	29
29	3.0	4.0									3.8	5
30*	12.0	10.3	3.3	4.0	*	3.2	2.5	5.0	7.4		5.6	27
31*	12.0	8.3	12.0	6.0	2.0	2.0	3.3	5.7	2.0		5.4	28
32*	9.0	13.8	4.0	7.5	4.0	4.2	3.5	2.0	3.2		5.7	29
33*			4.7	5.5	1.0	1.0	3.0	5.3	5.0		3.9	23
34*			1.3	4.3	1.0	3.8	2.5	2.7	1.6		2.6	23
Total	7.3	8.6	5.7	6.4	2.9	3.7	4.2	3.4	4.9	3.8	5.2	
# Point Counts	29	86	72	101	47	110	57	77	102	4		685

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 22: Raw Bird Abundance By Habitat - 2016

Habitat	# Stations	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
P	6	57	192	111	152	27	108	37	64	123		871
P/NR<30	3	37	104	61	126	22	72	69	46	119		656
NR<30	10	91	333	193	273	64	159	103	112	183	15	1526
NR>30	1	14	27	10	22	6	11	7	6	9		112
NR±30	2	3	16	14	22	2	4	6	16	25		108
OG	4	10	63	24	55	13	54	19	21	38		297
Total	26	212	735	413	650	134	408	241	265	497	15	3570

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.

TABLE 23: Bird Abundance Per Point Count By Habitat - 2016

Habitat	# Stations	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Overall	# Point Counts
P	6	9.5	8.7	5.6	6.3	2.7	3.6	3.1	3.2	4.4		5.1	172
P/NR<30	3	7.4	10.4	8.7	9.0	3.7	5.5	8.6	5.1	9.2		7.7	85
NR<30	10	7.0	9.5	6.7	6.3	3.0	3.7	3.8	3.5	4.9	3.8	5.4	284
NR>30	1	14.0	6.8	3.3	5.5	3.0	2.2	3.5	2.0	1.8		3.9	29
NR±30	2	3.0	4.0	4.7	5.5	1.0	1.0	3.0	5.3	5.0		3.9	28
OG	4	3.3	5.7	2.4	4.6	2.2	3.6	3.2	2.1	2.7		3.4	87
Overall	26	7.3	8.5	5.7	6.4	2.9	3.7	4.2	3.4	4.9	3.8	5.2	
# Point Counts		29	86	72	101	47	110	57	77	102	4		685

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.

TABLE 24: Raw Bird Species Abundance by Station – 2016

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
Cracidae							1	6	2	1					1					2		25		1		1	40
Black Guan							1	6	2	1					1					2		25		1		1	40
Odontophoridae			2				1			3			2													7	15
Spotted Wood-Quail			2				1			3			2													7	15
Accipitridae																				1							1
Falconidae								1																			1
Bat Falcon								1																			1
Trochilidae	28	16	10	4	10	8	2	7	16	18	27	31	23	22	54	25	28	31	12	25	3	35	16	31	3	7	492
Bronzy Hermit	1					1																					2
Brown Violetear														1				1									2
Fiery-throated Hummingbird																	1										1
Green Hermit	2		2			2				1	1	1	1				3		3			2		3	2	3	26
Green-crowned Brilliant										1		1	2									1	2				7
Green-fronted Lancebill															1												1
Lesser Violetear	4	3	1							1	1	2		2	4	2	1	1				1	1				24
Long-Billed Hermit																							1				1
Magenta-throated Woodstar	1											2		2	2	1		1	1			4					14
Purple-crowned Fairy			1									1		1									1	1			5
Rivoli's Hummingbird ¹													1	1	2	1											5
Rufous-tailed Hummingbird										1		1	1														3
Scintillant Hummingbird	4	8	1					3	5	6	1	4		2	6	2	1	1	3	4		6		1		1	59
Snowy-bellied Hummingbird																				1							1
Stripe-tailed Hummingbird	1		1						1		5	5	3	1	9	2	7	1	1	3		3	1	6		2	52
Violet Sabrewing															4		1					3	2	2			12
Violet-headed hummingbird												1	1		1			2		1							6
Volcano Hummingbird												1															1
White-necked Jacobin	1																										1
White-tailed Emerald													1		1							1					3
White-throated Mountain-gem	2	1	1	3	3			1	2		10	4	5	3	9	6	7	10	1	3	1			6		1	79
Hummingbird sp.	12	4	3	1	7	5	2	3	8	8	9	8	8	9	15	11	7	14	3	13	2	14	8	12	1		187
Columbidae			3		6	3		3	2	1	1	4	1	2						3			2		4	4	39
Band-tailed Pigeon											1	4								1						4	10
Chiriqui Quail-Dove										1													1		1		3
Ruddy Ground-Dove													1	2											2		5
Ruddy Pigeon			2		5	1		1	1											2			1				13

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Columbidae (cont'd)</i>																											
White-tipped Dove			1																								1
Pigeon sp.					1	2		2	1																1		7
<i>Psittacidae</i>	2			1	1				3	11	7	11		8		1		9					18	15			87
Sulphur-winged Parakeet	2			1	1				3	11	7	11		8		1		9					18	15			87
<i>Cuculidae</i>		1							4		3					2		2		3						1	16
Squirrel Cuckoo		1							4		3					2		2		3						1	16
<i>Trogonidae</i>	2			3	2			1				1	2	2					1							1	15
Collared Trogon	2			3	1			1				1	1	1					1								11
Resplendent Quetzal					1								1	1												1	4
<i>Momotidae</i>	1		1																	4							6
Lesson's Motmot	1		1																	4							6
<i>Capitonidae</i>		1	3	1	1	3		2		3	3	1		2	2		1	1	1	9	4				7		45
Red-headed Barbet		1	3	1	1	3		2		3	3	1		2	2		1	1	1	9	4				7		45
<i>Ramphastidae</i>	7	2		1		2	3	9	7	9	3	4	2	5	1	5			6	14	1		4	5	5	9	104
Northern Emerald-Toucanet	7	2		1		2	3	9	7	9	3	4	2	5	1	5			6	14	1		4	5	5	9	104
<i>Picidae</i>		2	2	1	1	1		3	1							1	1			2				1		2	18
Acorn Woodpecker		2							1																		3
Golden-olive Woodpecker			1														1			2							4
Hairy Woodpecker			1	1	1	1		3																1			8
Smoky-brown Woodpecker																1											1
Woodpecker sp.																										2	2
<i>Furnariidae</i>	1		6	15	4	16	3	3	1	1	2	1		6		1	4	4		1		5	6	1	2	7	90
Buff-fronted Foliage-gleaner				1							1																2
Buff-throated Foliage-gleaner																										1	1
Buffy Tuftedcheek					1																						1
Lineated Foliage-gleaner						1				1				1													3
Olivaceous Woodcreeper						1																				1	2
Plain Xenops																							1				1
Red-faced Spinetail			1	2		1								4			1	2		1		2				1	15
Spot-crowned Woodcreeper			1	5	3	2		1																	1	2	15
Spotted Barbtail				1		1						1		1			2	1				2	1	1			11
Spotted Woodcreeper						1																					1
Streak-breasted Treehunter	1			1																							2
Streak-headed Woodcreeper			1			3		1																	1		6
Wedge-billed Woodcreeper																	1									1	2
Woodcreeper sp.			3	5		6	3	1	1		1					1		1				1	4			1	28

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Thamnophilidae</i>			1																								1
Slaty Antwren			1																								1
<i>Tyrannidae</i>	19	10	1	6	17	3	1	6	9	15	10	6	10	17	6	8	4	10	11	8		9	4	13	2	4	209
Black Phoebe										1								2									3
Black-capped Flycatcher		1													1					2						3	7
Boat-billed Flycatcher		2			1					1	1													4			9
Bright-rumped Attila												1															1
Dark Pewee																				1							1
Dusky-capped Flycatcher	3									2	1								4	1		1					12
Eye-ringed Flatbill									1																1		2
Golden-bellied Flycatcher	4									2			1	5	2	2		4				1		1			22
Great Kiskadee	7	2						1	1		2			1			1					1		4			20
Least Flycatcher		1			1	1													1	1			1		1		7
Mountain Elaenia				1															1	1							3
Olive-sided Flycatcher											1																1
Olive-striped Flycatcher															1							1					2
Paltry Tyrannulet	1					1		1		5	2	2		1		1		2	1				1	1			19
Rough-legged Tyrannulet											1																1
Slaty-capped Flycatcher																			2								2
Tropical Kingbird																						1					1
Tropical Pewee	2																			1				2			5
Tufted Flycatcher				1	13									6	1		1						1				23
Western Wood-pewee											1					2											3
Yellow-bellied Flycatcher		1						1					1						1	1				1	1		7
Yellowish Flycatcher	2	3	1	4	2	1	1	3	7	4	1	3	8	4	1	3	2	2	1			4	1				58
<i>Tityridae</i>	1										1			1	1		1					3	1	3			12
Barred Becard														1	1							2		1			5
Black-and-white Becard											1						1					1	1				4
Masked Tityra	1																							2			3
<i>Turdidae</i>	14	3	4	3	5	2		5	4	5	11	5	2	8	3			1	8	29	2		4	9	6	3	136
Black-billed Nightingale-Thrush	2				1																						3
Black-faced Solitaire	1	1	2	1		2		1			4	1		2	3				2		2		1	3	1		27
Clay-colored Thrush	2			1	1					3	1			2					1	2							13
Mountain Thrush	1	1						1	2											5							10
Orange-billed Nightingale-Thrush												3															3
Ruddy-capped Nightingale-Thrush	4	1			3				1																		9
Slaty-backed Nightingale-thrush													1														1

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Turdidae (cont'd)</i>																											
Sooty Thrush	1													1									1	2			5
Swainson's Thrush	3		2					3	1	2	6	1	1	3					5	21			2	4	5	3	62
White-throated Thrush																				1							1
Nightingale-thrush sp.				1																							1
Thrush sp.																		1									1
<i>Cinclidae</i>															2												2
American Dipper															2												2
<i>Ptilonotidae</i>									1	1	3																5
Black-and-yellow Silky-flycatcher											1																1
Long-tailed Silky-flycatcher									1	1	2																4
<i>Troglodytidae</i>	6		7		1	1				1	10	7		11	6	4	16	3	3	1	2	1	1	4	1	1	87
Gray-breasted Wood-Wren			5								5	6		6	5	1	12		1		2	1		2			46
House Wren											1			1				1						1			4
Isthmian Wren										1										1							2
Ochraceous Wren	1		2		1	1											1		1							1	8
Rufous-breasted Wren	3													1	1			2	1					2			10
White-breasted Wood-Wren	2																										2
Wood-Wren sp.											2																2
Wren sp.											2	1		3		3	3							1			13
<i>Vireonidae</i>	5	4	5	3	2	2		7	7	28	4	15	2	15	1	9	6	4	4	25		10	4	2	6		170
Brown-capped Vireo	2	3	1	1				4	6	17	1	12	1	9		5	2	3	1	10		4	1		4		87
Lesser Greenlet																						2					2
Philadelphia Vireo	1	1	1	1	2	2		1	1	10	2	2	1	4	1	4	4	1		9		4	2	2	1		57
Rufous-browed Peppershrike	1		2								1								2								6
Yellow-throated Vireo	1									1									1	1				1			5
Yellow-winged Vireo			1	1				2				1											1				6
Vireo sp.														2						5							7
<i>Parulidae</i>	41	18	21	47	21	23	3	27	35	58	21	23	22	75	14	16	31	28	35	35		24	29	18	38	2	705
Black-and-white Warbler	4		1	7		3		3	2	3	1	1		3				2	4	3			2		10		49
Black-cheeked Warbler			1		2									2	2			3						2			12
Black-throated Green Warbler	2		1	4	1	1			6	5	1					1			3	3							28
Blackburnian Warbler										2										1					1		4
Collared Redstart				8	5						1			6						1			1				22
Costa Rican Warbler									1	2				1			4	3					4	2	1		18
Flame-throated Warbler		1		5	5	1				1				2						1			1		1		18
Golden-crowned Warbler			1						4				1	2	1		1								2		12

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Parulidae (cont'd)</i>																											
Golden-winged Warbler				2					3					1			1			1		1	1				10
Prothonotary Warbler	1																										1
Slate-throated Redstart	22	3	13	6	3	13	1	9	8	12	13	9	16	37	6	9	9	9	12	12		16	13	8	16	1	276
Tennessee Warbler		2			1			2	4	11		7		1	2	1	6	1	4	5		1	3	4	1		56
Townsend's Warbler	1	3		2	1				1	4	1		2	4		1	1	2	2			1					26
Tropical Parula									2	1				5			1			2					1		12
Wilson's Warbler	8	9	4	12	3	4	1	7	4	12	3	6	2	9	1	1	4	7	8	5		4	2	2	5	1	124
Worm-eating Warbler															1				1				2				4
Wrenthrush															1												1
Yellow-rumped Warbler										1				2													3
Yellow-throated Warbler																	1										1
Warbler sp.	3			1		1	1	6		4	1		1			3	3	1	1	1		1					28
<i>Thraupidae</i>	8	4	7	3	5	5	2	5	6	15	25	8	4	16	3	3	5	12	3	32		6	19	4	2		202
Bay-headed Tanager											1									7							8
Blue-gray Tanager																				1							1
Buff-throated Saltator										1									2	1							4
Cherrie's Tanager																	2		1			1					4
Gray-headed Tanager																							1				1
Palm Tanager											1			1								1					3
Peg-billed Finch										2										1							3
Scarlet-thighed Dacnis	1	2						3		5	7	1		1				2		9							31
Silver-throated Tanager	6		7	3	5	5	2	1	4	4	15	5	3	14	3	3	3	10		6		4	18	1	1		123
Slaty Flowerpiercer		1										1															2
Speckled Tanager	1							1	1	2	1		1							6				1			14
Streaked Saltator									1											1				2	1		5
Yellow-faced Grassquit		1										1															2
Tanager sp.										1																	1
<i>Emberizidae</i>	50	10	16	5	8	17	1	14	6	30	63	24	16	47	6	22	18	45	1	4		16	8	14	6	4	451
Chestnut-capped Brush-Finch	1		2	1				3	1	3	4	2		2	1	1	1	3				5		1	2		33
Common Chlorospingus	38	5	14	3	6	16	1	8	5	13	50	15	15	35	2	16	15	29	1	2		11	8	7	4	4	323
Rufous-collared Sparrow													1			1		3									5
Sooty-capped Chlorospingus						1				1																	2
White-naped Brushfinch	3	1		1						1	3	1		1						2							13
Yellow-thighed Finch	8	4			2			3		12	6	6		9	3	4	2	10						5			74
New World Sparrow, Finch or Ally sp.																								1			1

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
Cardinalidae	9	10	6	1	2			1	1	2	5	1		2	1	1	1	2	1	9		1	3		1		60
Blue Seed eater																1							2				3
Flame-colored Tanager	3	8	4	1	1			1	1	1	3	1			1			2	1	4							32
Hepatic Tanager	1									1																	2
Rose-breasted Grosbeak											1																1
Scarlet Tanager					1																						1
Summer Tanager	1										1			1			1						1				5
White-winged Tanager	4	2	2											1						5		1			1		16
Icteridae										1	2																3
Baltimore Oriole										1	2																3
Fringillidae	4	3			2		1	2	2	6	9	3		4		4	1		1	11				3	1		57
Elegant Euphonia	4	3						2	2	5	6	3		4		4				7				2			42
Golden-browed Chlorophonia					2		1				1									3					1		8
Lesser Goldfinch										1							1		1								3
Spot-crowned Euphonia											1													1			2
Yellow-bellied Siskin																				1							1
Finch sp.											1																1
Uncertain Family																											
Flycatcher sp.	1	1	2	1		2			2	2	2		1	2		2	1	1		2			2		1		25
Passerine sp.	21	26	12	27	16	13	15	10	17	17	32	22	22	16	8	22	20	27	11	19	7	17	29	40	4	6	476

Note: Starting in 2016, 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.
1, Magnificent Hummingbird prior to August 2017 (CLO 2017a). *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 25: Bird Species Abundance Per 10 Point Counts by Station – 2016

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
# Point Counts	29	29	29	29	29	30	5	29	29	29	28	28	28	28	29	28	28	28	29	29	5	27	28	29	23	23	685
<i>Cracidae</i>							2.0	2.1	0.7	0.3					0.3					0.7		9.3		0.3		0.4	0.58
Black Guan							2.0	2.1	0.7	0.3					0.3					0.7		9.3		0.3		0.4	0.58
<i>Odontophoridae</i>			0.7				2.0			1.0			0.7													3.0	0.22
Spotted Wood-Quail			0.7				2.0			1.0			0.7													3.0	0.22
<i>Accipitridae</i>																				0.3							0.01
<i>Falconidae</i>								0.3																			0.01
Bat Falcon								0.3																			0.01
<i>Trochilidae</i>	9.7	5.5	3.4	1.4	3.4	2.7	4.0	2.4	5.5	6.2	9.6	11.1	8.2	7.9	18.6	8.9	10.0	11.1	4.1	8.6	6.0	13.0	5.7	10.7	1.3	3.0	7.18
Bronzy Hermit	0.3					0.3																					0.03
Brown Violetear														0.4				0.4									0.03
Fiery-throated Hummingbird																	0.4										0.01
Green Hermit	0.7		0.7			0.7				0.3	0.4	0.4	0.4				1.1		1.0			0.7		1.0	0.9	1.3	0.38
Green-crowned Brilliant										0.3		0.4	0.7									0.4	0.7				0.10
Green-fronted Lancebill															0.3												0.01
Lesser Violetear	1.4	1.0	0.3							0.3	0.4	0.7		0.7	1.4	0.7	0.4	0.4				0.4	0.4				0.35
Long-Billed Hermit																							0.4				0.01
Magenta-throated Woodstar	0.3											0.7		0.7	0.7	0.4		0.4	0.3			1.5					0.20
Purple-crowned Fairy			0.3									0.4		0.4									0.4	0.3			0.07
Rivoli's Hummingbird ¹													0.4	0.4	0.7	0.4											0.07
Rufous-tailed Hummingbird										0.3		0.4	0.4														0.04
Scintillant Hummingbird	1.4	2.8	0.3					1.0	1.7	2.1	0.4	1.4		0.7	2.1	0.7	0.4	0.4	1.0	1.4		2.2		0.3		0.4	0.86
Snowy-bellied Hummingbird																				0.3							0.01
Stripe-tailed Hummingbird	0.3		0.3						0.3		1.8	1.8	1.1	0.4	3.1	0.7	2.5	0.4	0.3	1.0		1.1	0.4	2.1		0.9	0.76
Violet Sabrewing															1.4		0.4					1.1	0.7	0.7			0.18
Violet-headed hummingbird												0.4	0.4		0.3			0.7		0.3							0.09
Volcano Hummingbird												0.4															0.01
White-necked Jacobin	0.3																										0.01
White-tailed Emerald													0.4		0.3							0.4					0.04
White-throated Mountain-gem	0.7	0.3	0.3	1.0	1.0			0.3	0.7		3.6	1.4	1.8	1.1	3.1	2.1	2.5	3.6	0.3	1.0	2.0			2.1		0.4	1.15
Hummingbird sp.	4.1	1.4	1.0	0.3	2.4	1.7	4.0	1.0	2.8	2.8	3.2	2.9	2.9	3.2	5.2	3.9	2.5	5.0	1.0	4.5	4.0	5.2	2.9	4.1	0.4		2.73
<i>Columbidae</i>			1.0		2.1	1.0		1.0	0.7	0.3	0.4	1.4	0.4	0.7						1.0			0.7		1.7	1.7	0.57
Band-tailed Pigeon											0.4	1.4								0.3						1.7	0.15
Chiriqui Quail-Dove										0.3													0.4		0.4		0.04
Ruddy Ground-Dove													0.4	0.7											0.9		0.07

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Columbidae (cont'd)</i>																											
Ruddy Pigeon			0.7		1.7	0.3		0.3	0.3											0.7			0.4				0.19
White-tipped Dove			0.3																								0.01
Pigeon sp.					0.3	0.7		0.7	0.3																0.4		0.10
<i>Psittacidae</i>	0.7			0.3	0.3				1.0	3.8	2.5	3.9		2.9		0.4		3.2					6.4	5.2			1.27
Sulphur-winged Parakeet	0.7			0.3	0.3				1.0	3.8	2.5	3.9		2.9		0.4		3.2					6.4	5.2			1.27
<i>Cuculidae</i>		0.3							1.4		1.1					0.7		0.7		1.0						0.4	0.23
Squirrel Cuckoo		0.3							1.4		1.1					0.7		0.7		1.0						0.4	0.23
<i>Trogonidae</i>	0.7			1.0	0.7			0.3				0.4	0.7	0.7					0.3							0.4	0.22
Collared Trogon	0.7			1.0	0.3			0.3				0.4	0.4	0.4					0.3								0.16
Resplendent Quetzal					0.3								0.4	0.4												0.4	0.06
<i>Momotidae</i>	0.3		0.3																	1.4							0.09
Lesson's Motmot	0.3		0.3																	1.4							0.09
<i>Capitonidae</i>		0.3	1.0	0.3	0.3	1.0		0.7		1.0	1.1	0.4		0.7	0.7		0.4	0.4	0.3	3.1	8.0				3.0		0.66
Red-headed Barbet		0.3	1.0	0.3	0.3	1.0		0.7		1.0	1.1	0.4		0.7	0.7		0.4	0.4	0.3	3.1	8.0				3.0		0.66
<i>Ramphastidae</i>	2.4	0.7		0.3		0.7	6.0	3.1	2.4	3.1	1.1	1.4	0.7	1.8	0.3	1.8			2.1	4.8	2.0		1.4	1.7	2.2	3.9	1.52
Northern Emerald-Toucanet	2.4	0.7		0.3		0.7	6.0	3.1	2.4	3.1	1.1	1.4	0.7	1.8	0.3	1.8			2.1	4.8	2.0		1.4	1.7	2.2	3.9	1.52
<i>Picidae</i>		0.7	0.7	0.3	0.3	0.3		1.0	0.3							0.4	0.4			0.7				0.3		0.9	0.26
Acorn Woodpecker		0.7							0.3																		0.04
Golden-olive Woodpecker			0.3														0.4			0.7							0.06
Hairy Woodpecker			0.3	0.3	0.3	0.3		1.0																0.3			0.12
Smoky-brown Woodpecker																0.4											0.01
Woodpecker sp.																										0.9	0.03
<i>Furnariidae</i>	0.3		2.1	5.2	1.4	5.3	6.0	1.0	0.3	0.3	0.7	0.4		2.1		0.4	1.4	1.4		0.3		1.9	2.1	0.3	0.9	3.0	1.31
Buff-fronted Foliage-gleaner				0.3							0.4																0.03
Buff-throated Foliage-gleaner																										0.4	0.01
Buffy Tuftedcheek					0.3																						0.01
Lineated Foliage-gleaner						0.3				0.3				0.4													0.04
Olivaceous Woodcreeper						0.3																				0.4	0.03
Plain Xenops																							0.4				0.01
Red-faced Spinetail			0.3	0.7		0.3								1.4			0.4	0.7		0.3		0.7				0.4	0.22
Spot-crowned Woodcreeper			0.3	1.7	1.0	0.7		0.3																	0.4	0.9	0.22
Spotted Barbtail				0.3		0.3						0.4		0.4			0.7	0.4				0.7	0.4	0.3			0.16
Spotted Woodcreeper						0.3																					0.01
Streak-breasted Treehunter	0.3			0.3																							0.03
Streak-headed Woodcreeper			0.3			1.0		0.3																	0.4		0.09
Wedge-billed Woodcreeper																	0.4									0.4	0.03

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Furnariidae (cont'd)</i>																											
Woodcreeper sp.			1.0	1.7		2.0	6.0	0.3	0.3		0.4					0.4		0.4				0.4	1.4			0.4	0.41
<i>Thamnophilidae</i>			0.3																								0.01
Slaty Antwren			0.3																								0.01
<i>Tyrannidae</i>	6.6	3.4	0.3	2.1	5.9	1.0	2.0	2.1	3.1	5.2	3.6	2.1	3.6	6.1	2.1	2.9	1.4	3.6	3.8	2.8		3.3	1.4	4.5	0.9	1.7	3.05
Black Phoebe										0.3								0.7									0.04
Black-capped Flycatcher		0.3													0.3					0.7						1.3	0.10
Boat-billed Flycatcher		0.7			0.3					0.3	0.4													1.4			0.13
Bright-rumped Attila												0.4															0.01
Dark Pewee																				0.3							0.01
Dusky-capped Flycatcher	1.0									0.7	0.4								1.4	0.3		0.4					0.18
Eye-ringed Flatbill									0.3																	0.4	0.03
Golden-bellied Flycatcher	1.4									0.7			0.4	1.8	0.7	0.7		1.4				0.4		0.3			0.32
Great Kiskadee	2.4	0.7						0.3	0.3		0.7			0.4			0.4					0.4		1.4			0.29
Least Flycatcher		0.3			0.3	0.3													0.3	0.3			0.4		0.4		0.10
Mountain Elaenia				0.3															0.3	0.3							0.04
Olive-sided Flycatcher											0.4																0.01
Olive-striped Flycatcher															0.3							0.4					0.03
Paltry Tyrannulet	0.3					0.3		0.3		1.7	0.7	0.7		0.4		0.4		0.7	0.3				0.4	0.3			0.28
Rough-legged Tyrannulet											0.4																0.01
Slaty-capped Flycatcher																			0.7								0.03
Tropical Kingbird																						0.4					0.01
Tropical Pewee	0.7																			0.3				0.7			0.07
Tufted Flycatcher				0.3	4.5									2.1	0.3		0.4						0.4				0.34
Western Wood-pewee											0.4					0.7											0.04
Yellow-bellied Flycatcher		0.3						0.3					0.4						0.3	0.3				0.3	0.4		0.10
Yellowish Flycatcher	0.7	1.0	0.3	1.4	0.7	0.3	2.0	1.0	2.4	1.4	0.4	1.1	2.9	1.4	0.3	1.1	0.7	0.7	0.3			1.5	0.4				0.85
<i>Tityridae</i>	0.3										0.4			0.4	0.3		0.4					1.1	0.4	1.0			0.18
Barred Becard														0.4	0.3							0.7		0.3			0.07
Black-and-white Becard											0.4						0.4					0.4	0.4				0.06
Masked Tityra	0.3																							0.7			0.04
<i>Turdidae</i>	4.8	1.0	1.4	1.0	1.7	0.7		1.7	1.4	1.7	3.9	1.8	0.7	2.9	1.0			0.4	2.8	10.0	4.0		1.4	3.1	2.6	1.3	1.99
Black-billed Nightingale-Thrush	0.7				0.3																						0.04
Black-faced Solitaire	0.3	0.3	0.7	0.3		0.7		0.3			1.4	0.4		0.7	1.0				0.7		4.0		0.4	1.0	0.4		0.39
Clay-colored Thrush	0.7			0.3	0.3					1.0	0.4			0.7					0.3	0.7							0.19
Mountain Thrush	0.3	0.3						0.3	0.7											1.7							0.15
Orange-billed Nightingale-Thrush												1.1															0.04

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Turdidae (cont'd)</i>																											
Ruddy-capped Nightingale-Thrush	1.4	0.3			1.0				0.3																		0.13
Slaty-backed Nightingale-thrush													0.4														0.01
Sooty Thrush	0.3													0.4									0.4	0.7			0.07
Swainson's Thrush	1.0		0.7					1.0	0.3	0.7	2.1	0.4	0.4	1.1					1.7	7.2			0.7	1.4	2.2	1.3	0.91
White-throated Thrush																				0.3							0.01
Nightingale-thrush sp.				0.3																							0.01
Thrush sp.																		0.4									0.01
<i>Cinclidae</i>															0.7												0.03
American Dipper															0.7												0.03
<i>Ptilonotidae</i>									0.3	0.3	1.1																0.07
Black-and-yellow Silky-flycatcher											0.4																0.01
Long-tailed Silky-flycatcher									0.3	0.3	0.7																0.06
<i>Troglodytidae</i>	2.1		2.4		0.3	0.3				0.3	3.6	2.5		3.9	2.1	1.4	5.7	1.1	1.0	0.3	4.0	0.4	0.4	1.4	0.4	0.4	1.27
Gray-breasted Wood-Wren			1.7								1.8	2.1		2.1	1.7	0.4	4.3		0.3		4.0	0.4		0.7			0.67
House Wren											0.4			0.4				0.4							0.4		0.06
Isthmian Wren										0.3										0.3							0.03
Ochraceous Wren	0.3		0.7		0.3	0.3											0.4		0.3							0.4	0.12
Rufous-breasted Wren	1.0													0.4	0.3			0.7	0.3					0.7			0.15
White-breasted Wood-Wren	0.7																										0.03
Wood-Wren sp.											0.7																0.03
Wren sp.											0.7	0.4		1.1		1.1	1.1						0.4				0.19
<i>Vireonidae</i>	1.7	1.4	1.7	1.0	0.7	0.7		2.4	2.4	9.7	1.4	5.4	0.7	5.4	0.3	3.2	2.1	1.4	1.4	8.6		3.7	1.4	0.7	2.6		2.48
Brown-capped Vireo	0.7	1.0	0.3	0.3				1.4	2.1	5.9	0.4	4.3	0.4	3.2		1.8	0.7	1.1	0.3	3.4		1.5	0.4		1.7		1.27
Lesser Greenlet																						0.7					0.03
Philadelphia Vireo	0.3	0.3	0.3	0.3	0.7	0.7		0.3	0.3	3.4	0.7	0.7	0.4	1.4	0.3	1.4	1.4	0.4		3.1		1.5	0.7	0.7	0.4		0.83
Rufous-browed Peppershrike	0.3		0.7								0.4								0.7								0.09
Yellow-throated Vireo	0.3									0.3									0.3	0.3					0.4		0.07
Yellow-winged Vireo			0.3	0.3				0.7				0.4											0.4				0.09
Vireo sp.														0.7						1.7							0.10
<i>Parulidae</i>	14.1	6.2	7.2	16.2	7.2	7.7	6.0	9.3	12.1	20.0	7.5	8.2	7.9	26.8	4.8	5.7	11.1	10.0	12.1	12.1		8.9	10.4	6.2	16.5	0.9	10.29
Black-and-white Warbler	1.4		0.3	2.4		1.0		1.0	0.7	1.0	0.4	0.4		1.1				0.7	1.4	1.0			0.7		4.3		0.72
Black-cheeked Warbler			0.3		0.7									0.7	0.7			1.1						0.7			0.18
Black-throated Green Warbler	0.7		0.3	1.4	0.3	0.3			2.1	1.7	0.4					0.4			1.0	1.0							0.41
Blackburnian Warbler										0.7										0.3					0.4		0.06
Collared Redstart				2.8	1.7						0.4			2.1						0.3			0.4				0.32
Costa Rican Warbler									0.3	0.7				0.4			1.4	1.1					1.4	0.7	0.4		0.26

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Parulidae (cont'd)</i>																											
Flame-throated Warbler		0.3		1.7	1.7	0.3				0.3				0.7						0.3			0.4		0.4		0.26
Golden-crowned Warbler			0.3						1.4				0.4	0.7	0.3		0.4								0.9		0.18
Golden-winged Warbler				0.7					1.0					0.4			0.4			0.3		0.4	0.4				0.15
Prothonotary Warbler	0.3																										0.01
Slate-throated Redstart	7.6	1.0	4.5	2.1	1.0	4.3	2.0	3.1	2.8	4.1	4.6	3.2	5.7	13.2	2.1	3.2	3.2	3.2	4.1	4.1		5.9	4.6	2.8	7.0	0.4	4.03
Tennessee Warbler		0.7			0.3			0.7	1.4	3.8		2.5		0.4	0.7	0.4	2.1	0.4	1.4	1.7		0.4	1.1	1.4	0.4		0.82
Townsend's Warbler	0.3	1.0		0.7	0.3				0.3	1.4	0.4		0.7	1.4		0.4	0.4	0.7	0.7			0.4					0.38
Tropical Parula									0.7	0.3				1.8			0.4			0.7					0.4		0.18
Wilson's Warbler	2.8	3.1	1.4	4.1	1.0	1.3	2.0	2.4	1.4	4.1	1.1	2.1	0.7	3.2	0.3	0.4	1.4	2.5	2.8	1.7		1.5	0.7	0.7	2.2	0.4	1.81
Worm-eating Warbler															0.3				0.3				0.7				0.06
Wrenthrush															0.3												0.01
Yellow-rumped Warbler										0.3				0.7													0.04
Yellow-throated Warbler																	0.4										0.01
Warbler sp.	1.0			0.3		0.3	2.0	2.1		1.4	0.4		0.4			1.1	1.1	0.4	0.3	0.3		0.4					0.41
<i>Thraupidae</i>	2.8	1.4	2.4	1.0	1.7	1.7	4.0	1.7	2.1	5.2	8.9	2.9	1.4	5.7	1.0	1.1	1.8	4.3	1.0	11.0		2.2	6.8	1.4	0.9		2.95
Bay-headed Tanager											0.4									2.4							0.12
Blue-gray Tanager																				0.3							0.01
Buff-throated Saltator										0.3									0.7	0.3							0.06
Cherrie's Tanager																	0.7		0.3			0.4					0.06
Gray-headed Tanager																							0.4				0.01
Palm Tanager											0.4			0.4								0.4					0.04
Peg-billed Finch										0.7										0.3							0.04
Scarlet-thighed Dacnis	0.3	0.7						1.0		1.7	2.5	0.4		0.4				0.7		3.1							0.45
Silver-throated Tanager	2.1		2.4	1.0	1.7	1.7	4.0	0.3	1.4	1.4	5.4	1.8	1.1	5.0	1.0	1.1	1.1	3.6		2.1		1.5	6.4	0.3	0.4		1.80
Slaty Flowerpiercer		0.3										0.4															0.03
Speckled Tanager	0.3							0.3	0.3	0.7	0.4		0.4							2.1				0.3			0.20
Streaked Saltator									0.3											0.3				0.7	0.4		0.07
Yellow-faced Grassquit		0.3										0.4															0.03
Tanager sp.										0.3																	0.01
<i>Emberizidae</i>	17.2	3.4	5.5	1.7	2.8	5.7	2.0	4.8	2.1	10.3	22.5	8.6	5.7	16.8	2.1	7.9	6.4	16.1	0.3	1.4		5.9	2.9	4.8	2.6	1.7	6.58
Chestnut-capped Brush-Finch	0.3		0.7	0.3				1.0	0.3	1.0	1.4	0.7		0.7	0.3	0.4	0.4	1.1				1.9		0.3	0.9		0.48
Common Chlorospingus	13.1	1.7	4.8	1.0	2.1	5.3	2.0	2.8	1.7	4.5	17.9	5.4	5.4	12.5	0.7	5.7	5.4	10.4	0.3	0.7		4.1	2.9	2.4	1.7	1.7	4.72
Rufous-collared Sparrow													0.4			0.4		1.1									0.07
Sooty-capped Chlorospingus						0.3				0.3																	0.03
White-naped Brushfinch	1.0	0.3		0.3						0.3	1.1	0.4		0.4						0.7							0.19
Yellow-thighed Finch	2.8	1.4			0.7			1.0		4.1	2.1	2.1		3.2	1.0	1.4	0.7	3.6						1.7			1.08

Station	1*	3*	5*	7*	9*	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	33*	34*	Total
<i>Emberizidae (cont'd)</i>																											
New World Sparrow, Finch or Ally sp.																								0.3			0.01
<i>Cardinalidae</i>	3.1	3.4	2.1	0.3	0.7			0.3	0.3	0.7	1.8	0.4		0.7	0.3	0.4	0.4	0.7	0.3	3.1		0.4	1.1		0.4		0.88
Blue Seed eater																0.4							0.7				0.04
Flame-colored Tanager	1.0	2.8	1.4	0.3	0.3			0.3	0.3	0.3	1.1	0.4			0.3			0.7	0.3	1.4							0.47
Hepatic Tanager	0.3									0.3																	0.03
Rose-breasted Grosbeak											0.4																0.01
Scarlet Tanager					0.3																						0.01
Summer Tanager	0.3										0.4			0.4			0.4						0.4				0.07
White-winged Tanager	1.4	0.7	0.7											0.4						1.7		0.4			0.4		0.23
<i>Icteridae</i>										0.3	0.7																0.04
Baltimore Oriole										0.3	0.7																0.04
<i>Fringillidae</i>	1.4	1.0			0.7		2.0	0.7	0.7	2.1	3.2	1.1		1.4		1.4	0.4		0.3	3.8				1.0	0.4		0.83
Elegant Euphonia	1.4	1.0						0.7	0.7	1.7	2.1	1.1		1.4		1.4				2.4				0.7			0.61
Golden-browed Chlorophonia					0.7		2.0				0.4									1.0					0.4		0.12
Lesser Goldfinch										0.3							0.4		0.3								0.04
Spot-crowned Euphonia											0.4													0.3			0.03
Yellow-bellied Siskin																				0.3							0.01
Finch sp.											0.4																0.01
<i>Uncertain Family</i>																											
Flycatcher sp.	0.3	0.3	0.7	0.3		0.7			0.7	0.7	0.7		0.4	0.7		0.7	0.4	0.4		0.7			0.7		0.4		0.36
Passerine sp.	7.2	9.0	4.1	9.3	5.5	4.3	30.0	3.4	5.9	5.9	11.4	7.9	7.9	5.7	2.8	7.9	7.1	9.6	3.8	6.6	14.0	6.3	10.4	13.8	1.7	2.6	6.95

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: Starting in 2016, 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.
1, Magnificent Hummingbird prior to August 2017 (CLO 2017a). *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 26: Bird Species Abundance Per 10 Point Counts by Habitat – 2016

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
# Point Counts	172	85	284	29	28	87	685
Cracidae	1.6	0.1	0.1	2.1		0.2	0.58
Black Guan	1.6	0.1	0.1	2.1		0.2	0.58
Odontophoridae		0.4	0.1			0.9	0.22
Spotted Wood-Quail		0.4	0.1			0.9	0.22
Accipitridae			0.0				0.01
Falconidae				0.3			0.01
Bat Falcon				0.3			0.01
Trochilidae	8.0	8.4	8.6	2.4	2.1	3.1	7.18
Bronzy Hermit	0.1					0.1	0.03
Brown Violetear		0.1	0.0				0.03
Fiery-throated Hummingbird			0.0				0.01
Green Hermit	0.6	0.2	0.2		0.7	0.6	0.38
Green-crowned Brilliant	0.1	0.2	0.1				0.10
Green-fronted Lancebill			0.0				0.01
Lesser Violetear	0.5	0.6	0.4				0.35
Long-Billed Hermit			0.0				0.01
Magenta-throated Woodstar	0.3	0.5	0.1				0.20
Purple-crowned Fairy	0.1	0.2	0.1				0.07
Rivoli's Hummingbird ¹		0.1	0.1				0.07
Rufous-tailed Hummingbird		0.2	0.0				0.04
Scintillant Hummingbird	1.6	1.4	0.6	1.0		0.1	0.86
Snowy-bellied Hummingbird			0.0				0.01
Stripe-tailed Hummingbird	0.7	0.7	1.1			0.2	0.76
Violet Sabrewing	0.3		0.2				0.18
Violet-headed hummingbird		0.1	0.2				0.09
Volcano Hummingbird		0.1					0.01
White-necked Jacobin	0.1						0.01
White-tailed Emerald	0.1		0.1				0.04
White-throated Mountain-gem	0.7	0.8	1.9	0.3	0.4	0.5	1.15
Hummingbird sp.	3.1	2.9	3.1	1.0	1.1	1.6	2.73
Columbidae	0.1	0.8	0.4	1.0	1.4	1.5	0.57
Band-tailed Pigeon		0.5	0.1			0.5	0.15
Chiriqui Quail-Dove		0.1	0.0		0.4		0.04
Ruddy Ground-Dove		0.2	0.0		0.7		0.07
Ruddy Pigeon	0.1		0.2	0.3		0.7	0.19
White-tipped Dove			0.0				0.01
Pigeon sp.	0.1			0.7	0.4	0.3	0.10
Psittacidae	1.2	3.5	1.3			0.1	1.27
Sulphur-winged Parakeet	1.2	3.5	1.3			0.1	1.27
Cuculidae	0.3		0.4			0.1	0.23
Squirrel Cuckoo	0.3		0.4			0.1	0.23
Trogonidae	0.2	0.4	0.2	0.3		0.3	0.22
Collared Trogon	0.2	0.2	0.1	0.3		0.1	0.16
Resplendent Quetzal		0.1	0.0			0.2	0.06
Momotidae	0.1		0.2				0.09
Lesson's Motmot	0.1		0.2				0.09
Capitonidae	0.1	0.7	0.7	0.7	3.9	0.5	0.66
Red-headed Barbet	0.1	0.7	0.7	0.7	3.9	0.5	0.66
Ramphastidae	1.6	2.1	1.1	3.1	2.1	1.6	1.52
Northern Emerald-Toucanet	1.6	2.1	1.1	3.1	2.1	1.6	1.52

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
<i>Picidae</i>	0.2		0.2	1.0		0.5	0.26
Acorn Woodpecker	0.2						0.04
Golden-olive Woodpecker			0.1				0.06
Hairy Woodpecker	0.1		0.1	1.0		0.2	0.12
Smoky-brown Woodpecker			0.0				0.01
Woodpecker sp.						0.2	0.03
<i>Furnariidae</i>	0.5	0.9	1.4	1.0	0.7	3.4	1.31
Buff-fronted Foliage-gleaner			0.1				0.03
Buff-throated Foliage-gleaner						0.1	0.01
Buffy Tuftedcheek						0.1	0.01
Lineated Foliage-gleaner		0.2				0.1	0.04
Olivaceous Woodcreeper						0.2	0.03
Plain Xenops			0.0				0.01
Red-faced Spinetail	0.1	0.5	0.2			0.2	0.22
Spot-crowned Woodcreeper			0.2	0.3	0.4	0.8	0.22
Spotted Barbtail	0.2	0.2	0.2			0.1	0.16
Spotted Woodcreeper						0.1	0.01
Streak-breasted Treehunter	0.1		0.0				0.03
Streak-headed Woodcreeper			0.0	0.3	0.4	0.3	0.09
Wedge-billed Woodcreeper			0.0			0.1	0.03
Woodcreeper sp.	0.1		0.5	0.3		1.1	0.41
<i>Thamnophilidae</i>			0.0				0.01
Slaty Antwren			0.0				0.01
<i>Tyrannidae</i>	4.1	4.5	2.4	2.1	0.7	2.9	3.05
Black Phoebe		0.1	0.1				0.04
Black-capped Flycatcher	0.1		0.1			0.3	0.10
Boat-billed Flycatcher	0.3	0.1	0.0			0.1	0.13
Bright-rumped Attila		0.1					0.01
Dark Pewee			0.0				0.01
Dusky-capped Flycatcher	0.5	0.2	0.1				0.18
Eye-ringed Flatbill	0.1					0.1	0.03
Golden-bellied Flycatcher	0.3	0.8	0.3				0.32
Great Kiskadee	0.9	0.1	0.1	0.3			0.29
Least Flycatcher	0.1		0.1		0.4	0.2	0.10
Mountain Elaenia	0.1		0.1				0.04
Olive-sided Flycatcher			0.0				0.01
Olive-striped Flycatcher	0.1		0.0				0.03
Paltry Tyrannulet	0.2	0.9	0.2	0.3		0.1	0.28
Rough-legged Tyrannulet			0.0				0.01
Slaty-capped Flycatcher	0.1						0.03
Tropical Kingbird	0.1						0.01
Tropical Pewee	0.2		0.0				0.07
Tufted Flycatcher		0.7	0.1			1.5	0.34
Western Wood-pewee			0.1				0.04
Yellow-bellied Flycatcher	0.2		0.1	0.3	0.4		0.10
Yellowish Flycatcher	1.0	1.3	0.8	1.0		0.5	0.85
<i>Tityridae</i>	0.4	0.1	0.1				0.18
Barred Becard	0.2	0.1	0.0				0.07
Black-and-white Becard	0.1		0.1				0.06
Masked Tityra	0.2						0.04
<i>Turdidae</i>	2.2	2.1	2.0	1.7	2.9	1.1	1.99
Black-billed Nightingale-Thrush	0.1					0.1	0.04

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
<i>Turdidae (cont'd)</i>							
Black-faced Solitaire	0.4	0.4	0.4	0.3	1.1	0.2	0.39
Clay-colored Thrush	0.2	0.6	0.1			0.1	0.19
Mountain Thrush	0.2		0.2	0.3			0.15
Orange-billed Nightingale-Thrush		0.4					0.04
Ruddy-capped Nightingale-Thrush	0.3					0.3	0.13
Slaty-backed Nightingale-thrush			0.0				0.01
Sooty Thrush	0.2	0.1	0.0				0.07
Swainson's Thrush	0.8	0.7	1.1	1.0	1.8	0.3	0.91
White-throated Thrush			0.0				0.01
Nightingale-thrush sp.			0.0				0.01
Thrush sp.			0.0				0.01
<i>Cinclidae</i>			0.1				0.03
American Dipper			0.1				0.03
<i>Ptilonotidae</i>	0.1	0.1	0.1				0.07
Black-and-yellow Silky-flycatcher			0.0				0.01
Long-tailed Silky-flycatcher	0.1	0.1	0.1				0.06
<i>Troglodytidae</i>	0.8	2.2	1.7		1.1	0.3	1.27
Gray-breasted Wood-Wren	0.2	1.4	1.0		0.7		0.67
House Wren		0.1	0.1		0.4		0.06
Isthmian Wren		0.1	0.0				0.03
Ochraceous Wren	0.1		0.1			0.3	0.12
Rufous-breasted Wren	0.3	0.1	0.1				0.15
White-breasted Wood-Wren	0.1						0.03
Wood-Wren sp.			0.1				0.03
Wren sp.		0.5	0.3				0.19
<i>Vireonidae</i>	1.9	6.8	2.2	2.4	2.1	0.5	2.48
Brown-capped Vireo	0.9	4.5	0.9	1.4	1.4		1.27
Lesser Greenlet	0.1						0.03
Philadelphia Vireo	0.5	1.9	0.9	0.3	0.4	0.5	0.83
Rufous-browed Peppershrike	0.2		0.1				0.09
Yellow-throated Vireo	0.1	0.1	0.0		0.4		0.07
Yellow-winged Vireo		0.1	0.1	0.7			0.09
Vireo sp.		0.2	0.2				0.10
<i>Parulidae</i>	9.9	18.4	9.3	9.3	13.6	5.6	10.29
Black-and-white Warbler	0.6	0.8	0.6	1.0	3.6	0.3	0.72
Black-cheeked Warbler	0.1	0.2	0.2			0.2	0.18
Black-throated Green Warbler	0.6	0.6	0.4			0.2	0.41
Blackburnian Warbler		0.2	0.0		0.4		0.06
Collared Redstart		0.7	0.4			0.6	0.32
Costa Rican Warbler	0.2	0.4	0.4		0.4		0.26
Flame-throated Warbler	0.1	0.4	0.2		0.4	0.7	0.26
Golden-crowned Warbler	0.2	0.2	0.1		0.7		0.18
Golden-winged Warbler	0.2	0.1	0.2				0.15
Prothonotary Warbler	0.1						0.01
Slate-throated Redstart	4.0	6.8	3.7	3.1	5.7	2.1	4.03
Tennessee Warbler	0.9	2.2	0.6	0.7	0.4	0.1	0.82
Townsend's Warbler	0.5	0.9	0.3			0.1	0.38
Tropical Parula	0.1	0.7	0.1		0.4		0.18
Wilson's Warbler	2.0	3.2	1.4	2.4	1.8	1.0	1.81
Worm-eating Warbler	0.1		0.1				0.06
Wrenthrush			0.0				0.01

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
Parulidae (cont'd)							
Yellow-rumped Warbler		0.4					0.04
Yellow-throated Warbler			0.0				0.01
Warbler sp.	0.3	0.5	0.4	2.1		0.2	0.41
Thraupidae	1.8	4.6	4.0	1.7	0.7	1.4	2.95
Bay-headed Tanager			0.3				0.12
Blue-gray Tanager			0.0				0.01
Buff-throated Saltator	0.1	0.1	0.0				0.06
Cherrie's Tanager	0.1		0.1				0.06
Gray-headed Tanager			0.0				0.01
Palm Tanager	0.1	0.1	0.0				0.04
Peg-billed Finch		0.2	0.0				0.04
Scarlet-thighed Dacnis	0.2	0.8	0.6	1.0			0.45
Silver-throated Tanager	0.9	2.7	2.5	0.3	0.4	1.4	1.80
Slaty Flowerpiercer	0.1	0.1					0.03
Speckled Tanager	0.2	0.2	0.3	0.3			0.20
Streaked Saltator	0.2		0.0		0.4		0.07
Yellow-faced Grassquit	0.1	0.1					0.03
Tanager sp.		0.1					0.01
Emberizidae	5.6	11.9	7.1	4.8	2.1	3.4	6.58
Chestnut-capped Brush-Finch	0.5	0.8	0.5	1.0	0.7		0.48
Common Chlorospingus	3.9	7.4	5.4	2.8	1.4	3.1	4.72
Rufous-collared Sparrow			0.2				0.07
Sooty-capped Chlorospingus		0.1				0.1	0.03
White-naped Brushfinch	0.2	0.4	0.2				0.19
Yellow-thighed Finch	1.0	3.2	0.9	1.0		0.2	1.08
New World Sparrow, Finch or Ally sp.	0.1						0.01
Cardinalidae	1.3	0.6	1.0	0.3	0.4	0.2	0.88
Blue Seed eater			0.1				0.04
Flame-colored Tanager	0.8	0.2	0.5	0.3		0.1	0.47
Hepatic Tanager	0.1	0.1					0.03
Rose-breasted Grosbeak			0.0				0.01
Scarlet Tanager						0.1	0.01
Summer Tanager	0.1	0.1	0.1				0.07
White-winged Tanager	0.4	0.1	0.2		0.4		0.23
Icteridae		0.1	0.1				0.04
Baltimore Oriole		0.1	0.1				0.04
Fringillidae	0.8	1.5	0.9	0.7	0.4	0.3	0.83
Elegant Euphonia	0.6	1.4	0.6	0.7			0.61
Golden-browed Chlorophonia			0.1		0.4	0.3	0.12
Lesser Goldfinch	0.1	0.1	0.0				0.04
Spot-crowned Euphonia	0.1		0.0				0.03
Yellow-bellied Siskin			0.0				0.01
Finch sp.			0.0				0.01
Uncertain Family							
Flycatcher sp.	0.2	0.5	0.5		0.4	0.2	0.36
Passerine sp.	7.7	6.5	7.7	3.4	3.9	5.7	6.95

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.

1, Magnificent Hummingbird prior to August 2017 (CLO 2017a).

4.1.3.2 THREATENED SPECIES ABUNDANCE

4.1.3.2.1 BLACK GUAN

Black Guan was identified during both point count and walking surveys (Table 19). During point counts, Black Guan had an overall abundance of 0.58/10 PC (Table 25). They were found at 9 stations (13, 14, 15, 16, 22, 28, 30, 32, and 34), were most abundant at Station 30 (9.3/10 PC), and least abundant at stations 22 and 32 (0.3/10 PC), followed closely by Station 34 (0.4/10 PC) (Figure 16). Black Guan were primarily found in NR>30 (2.1/10 PC) and P habitats (1.6/10 PC), and not found at all in NR±30 (Table 26).

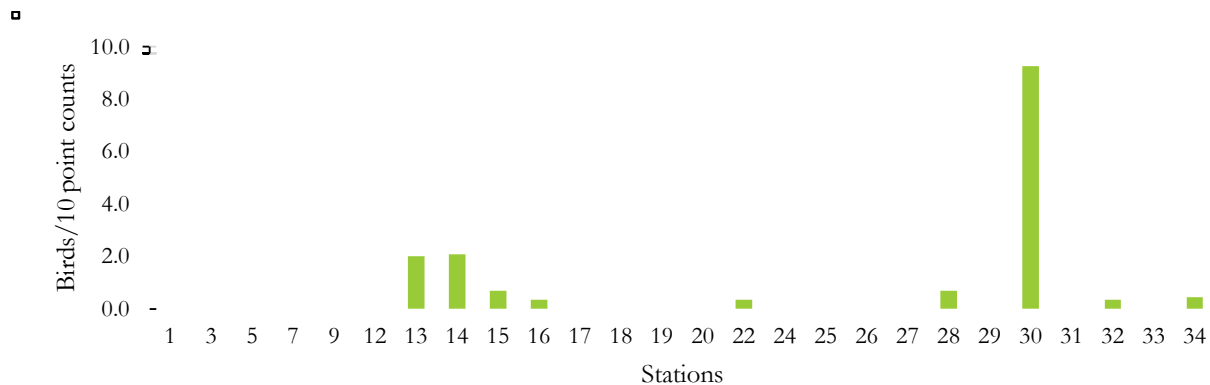


FIGURE 16: Abundance of Black Guan during point count surveys across all stations.

4.1.3.2.2 GOLDEN-WINGED WARBLER

Golden-winged Warbler was identified during both point count and walking surveys (Table 19). During point counts, Golden-winged Warbler had an overall abundance of 0.15/10 PC (Table 25). They were found at 7 stations (7, 15, 20, 25, 28, 30, and 31), were most abundant at stations 15 and 7 (1.0 and 0.7/10 PC, respectively) (Figure 17). Golden-winged Warbler had similar abundances in P, NR<30, and P/NR<30 (0.1 or 0.2/10 PC) and were not found in the other habitats (Table 26).

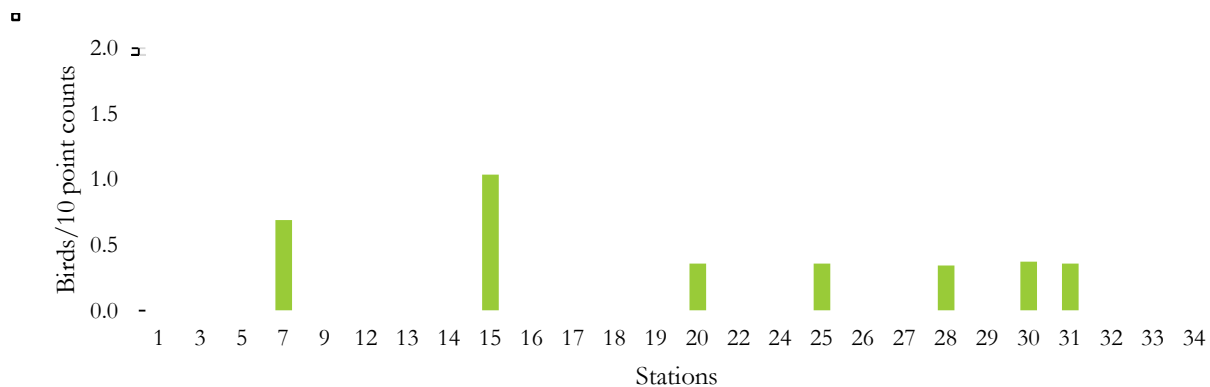


FIGURE 17: Abundance of Golden-winged Warbler during point count surveys across all stations.

4.1.3.2.3 OLIVE-SIDED FLYCATCHER

A single Olive-sided Flycatcher was identified during a point count at Station 17 (NR<30) on September 16, 2016 (abundance of 0.4/10 PC) (Table 25).

4.1.3.2.4 ORNATE HAWK-EAGLE

A single adult, Ornate Hawk-Eagle was observed outside of the survey area during a point count at Station 7 (NR<30) on November 21, 2016.

4.1.3.2.5 RESPLENDENT QUETZAL

Resplendent Quetzal was identified during both point count and walking surveys (Table 19). During point counts, Resplendent Quetzal had an overall abundance of 0.06/10 PC (Table 25). They were found at 4 stations (9, 19, 20 and 34) at an abundance of 0.3 or 0.4/10 PC for each station (Figure 18). Resplendent Quetzal were most abundant in OG (0.2/10 PC) and not found at all in P, NR>30 or NR±30 (Table 26).

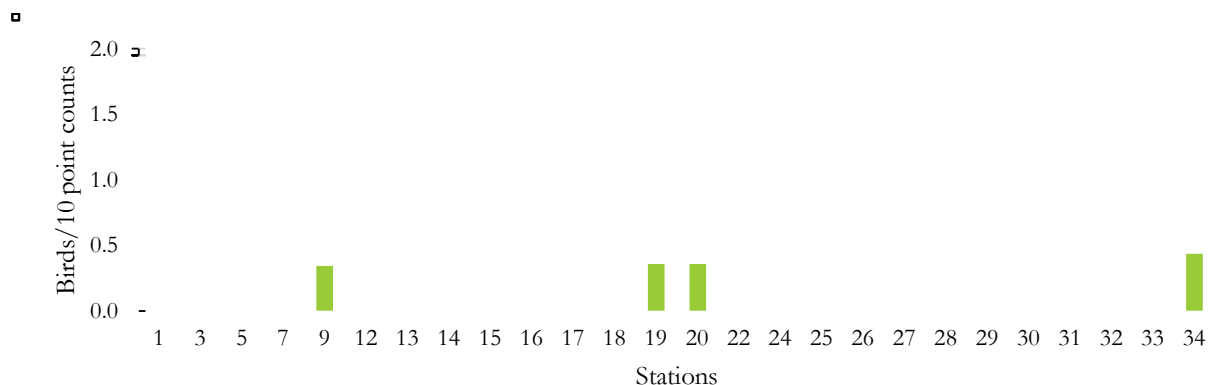


FIGURE 18: Abundance of Resplendent Quetzal during point count surveys across all stations.

4.1.3.2.6 RUDDY PIGEON

Ruddy Pigeon was identified during both point count and walking surveys (Table 19). During point counts, Ruddy Pigeon had an overall abundance of 0.19/10 PC (Table 25). They were found at 7 stations (5, 9, 12, 14, 15, 28, and 31), were most abundant at Station 9 (1.7/10 PC), and at low levels at the other sites (Figure 19). Ruddy Pigeon were primarily found in OG (0.7/10 PC) and not found at all in P/NR<30 or NR±30 (Table 26).

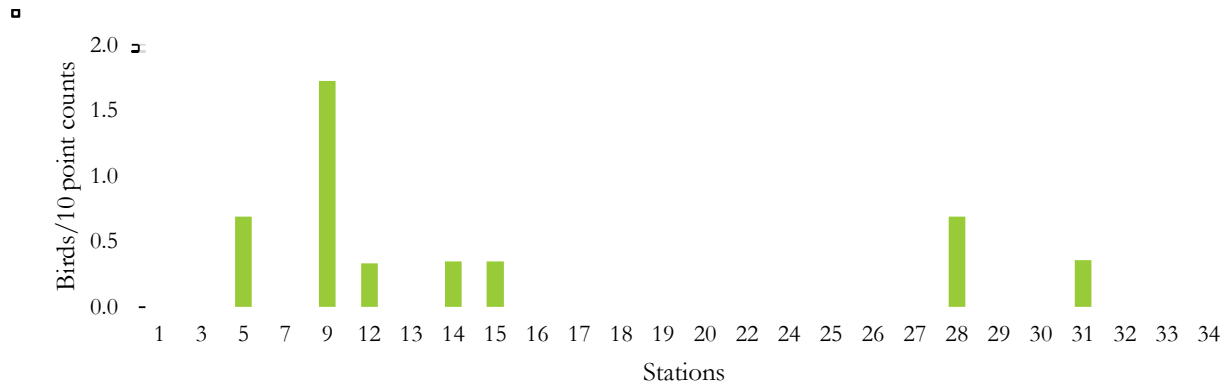


FIGURE 19: Abundance of Ruddy Pigeon during point count surveys across all stations.

4.1.4 RICHNESS & DIVERSITY

Overall, 155 bird species from 29 different families were identified during point count surveys with, in total, 0.2 species identified per point count (Table 27). The highest species richness was found at stations 20 (1.96 species/point count), 28 and 17 (1.86 species/point count). The lowest species richness was found at stations 12 (0.90 species/point count), 34 (0.96 species/point count), 19 and 29 (1.00 species/point count). Looking at habitats, the highest species richness was found in NR>30 and NR±30 (1.1 species/point count), and the lowest in P and NR<30 (0.5 species/point count) (Table 28).

Overall, SID was 0.963 (Table 27). The highest SIDs were found at stations 28 (0.966), 15 (0.965), and 16 (0.963), while the lowest were found at stations 29 (0.822), 19 (0.906), and 12 (0.911). Looking at habitats, the highest SID was found in P (0.965) and the lowest in NR±30 (0.934) (Table 28). 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 27: Richness and Diversity By Station - 2016

Station	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
1*	29	17	52	1.79	0.933
3*	29	14	32	1.10	0.958
5*	29	17	37	1.28	0.943
7*	29	15	32	1.10	0.952
9*	29	17	32	1.10	0.952
12*	30	14	27	0.90	0.911
13	5	11	9	1.80	0.939
14*	29	18	33	1.14	0.958
15*	29	18	35	1.21	0.965
16*	29	20	51	1.76	0.963
17*	28	20	52	1.86	0.915
18*	28	17	41	1.46	0.958
19*	28	12	28	1.00	0.906
20*	28	18	55	1.96	0.938
22*	29	15	36	1.24	0.961
24*	28	15	29	1.04	0.937
25*	28	14	36	1.29	0.945
26*	28	14	34	1.21	0.926
27*	29	14	36	1.24	0.956
28*	29	20	54	1.86	0.966
29	5	6	5	1.00	0.822
30*	27	12	34	1.26	0.922
31*	28	15	37	1.32	0.922
32*	29	16	38	1.31	0.960
33*	23	15	30	1.30	0.930
34*	23	15	22	0.96	0.935
Overall	685	29	155	0.23	0.963

1, Simpson's Index of Diversity. *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 28: Richness and Diversity By Habitat - 2016

Habitat	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
P	172	23	94	0.5	0.965
P/NR<30	85	22	85	1.0	0.957
NR<30	284	28	128	0.5	0.959
NR>30	29	17	33	1.1	0.958
NR±30	28	15	32	1.1	0.934
OG	87	21	56	0.6	0.959
Overall	685	29	155	0.2	0.963

1, Simpson's Index of Diversity.

4.2 2015

4.2.1 SPECIES IDENTIFIED

Overall, 96 unique bird species were identified during point count surveys in 2015 (Table 29). Of those, 95 were identified visually and 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. One species was identified only by its song inside the survey area, Speckled Tanager (*Tangara guttata*).

4.2.1.1 THREATENED SPECIES

Three (3) species on the IUCN Redlist of Threatened Species (www.iucnredlist.org) were identified during the survey period (Table 29). Of these, the Ruddy Pigeon is considered Vulnerable (VU). The other two are considered Near Threatened (NT): Black Guan and Resplendent Quetzal.

TABLE 29: Bird Species Identified, All Methods – 2015

English Name	Scientific Name	IUCN Status ¹	IN Visual ²	IN Audio Only ³
Cracidae				
Black Guan	<i>Chamaepetes unicolor</i>	NT	x	
Odontophoridae				
Spotted Wood-Quail	<i>Odontophorus guttatus</i>	LC	x	
Accipitridae				
Barred Hawk	<i>Morphnarchus princeps</i>	LC	x	
Apodidae				
White-collared Swift	<i>Streptoprocne zonaris</i>	LC	x	
Trochilidae				
Green Hermit	<i>Phaethornis guy</i>	LC	x	
Green-crowned Brilliant	<i>Heliodoxa jacula</i>	LC	x	
Lesser Violetear	<i>Colibri cyanotus</i>	LC	x	
Purple-crowned Fairy	<i>Heliotbryx barroti</i>	LC	x	
Purple-throated Mountain-Gem	<i>Lampornis calolaemus</i>	LC	x	
Rivoli's Hummingbird ⁴	<i>Eugenes fulgens</i>	LC	x	
Rufous-tailed Hummingbird	<i>Amazilia tzacatl</i>	LC	x	
Scintillant Hummingbird	<i>Selasphorus scintilla</i>	LC	x	
Snowy-bellied Hummingbird	<i>Amazilia edward</i>	LC	x	
Stripe-tailed Hummingbird	<i>Eupherusa eximia</i>	LC	x	
Violet Sabrewing	<i>Camptopterus hemileucurus</i>	LC	x	
White-tailed Emerald	<i>Elvira chionura</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	
Gray-headed Dove	<i>Leptotila plumbeiceps</i>	LC	x	
Ruddy Pigeon	<i>Patagioenas subvinacea</i>	VU	x	
Psittacidae				
Sulphur-winged Parakeet	<i>Pyrrhura hoffmanni</i>	LC	x	
Cuculidae				
Squirrel Cuckoo	<i>Piaya cayana</i>	LC	x	
Trogonidae				
Collared Trogon	<i>Trogon collaris</i>	LC	x	
Resplendent Quetzal	<i>Pharomachrus mocinno</i>	NT	x	
Capitonidae				
Red-headed Barbet	<i>Eubucco bourcierri</i>	LC	x	
Ramphastidae				
Northern Emerald-Toucanet	<i>Aulacorhynchus prasinus</i>	LC	x	
Picidae				
Hairy Woodpecker	<i>Picoides villosus</i>	LC	x	
Red-crowned Woodpecker	<i>Melanerpes rubricapillus</i>	LC	x	
Furnariidae				
Lineated Foliage-gleaner	<i>Syndactyla subalaris</i>	LC	x	
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>	LC	x	
Red-faced Spinetail	<i>Craniolaema erythropus</i>	LC	x	
Ruddy Treerunner	<i>Margarornis rubiginosus</i>	LC	x	
Spot-crowned Woodcreeper	<i>Lepidocolaptes affinis</i>	LC	x	
Spotted Barbtail	<i>Premnoplex brunescens</i>	LC	x	
Streak-breasted Treehunter	<i>Thripadectes rufobrunneus</i>	LC	x	
Streak-headed Woodcreeper	<i>Lepidocolaptes souleyetii</i>	LC	x	

English Name	Scientific Name	IUCN Status ¹	IN Visual ²	IN Audio Only ³
Rhinocryptidae				
Silvery-fronted Tapaculo	<i>Scytalopus argentifrons</i>	LC	x	
Tyrannidae				
Black-capped Flycatcher	<i>Empidonax atriceps</i>	LC	x	
Boat-billed Flycatcher	<i>Megarhynchus pitangua</i>	LC	x	
Golden-bellied Flycatcher	<i>Myiodynastes hemichrysus</i>	LC	x	
Paltry Tyrannulet	<i>Zimmerius vilissimus</i>	LC	x	
Slaty-capped Flycatcher	<i>Leptopogon superciliaris</i>	LC	x	
Social Flycatcher	<i>Myiozetetes similis</i>	LC	x	
Tufted Flycatcher	<i>Mitrephanes phaeocercus</i>	LC	x	
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	LC	x	
Yellowish Flycatcher	<i>Empidonax flavescens</i>	LC	x	
Tityridae				
Barred Becard	<i>Pachyramphus versicolor</i>	LC	x	
Corvidae				
Brown Jay	<i>Psilorhinus morio</i>	LC	x	
Turdidae				
Black-faced Solitaire	<i>Myadestes melanops</i>	LC	x	
Clay-colored Thrush	<i>Turdus grayi</i>	LC	x	
Mountain Thrush	<i>Turdus plebejus</i>	LC	x	
Ruddy-capped Nightingale-Thrush	<i>Catharus frantzii</i>	LC	x	
Swainson's Thrush	<i>Catharus ustulatus</i>	LC	x	
Troglodytidae				
Gray-breasted Wood-Wren	<i>Henicorbina leucophrys</i>	LC	x	
House Wren	<i>Troglodytes aedon</i>	LC	x	
Rufous-breasted Wren	<i>Phengopedius rutilus</i>	LC	x	
Vireonidae				
Brown-capped Vireo	<i>Vireo leucophrys</i>	LC	x	
Philadelphia Vireo	<i>Vireo philadelphicus</i>	LC	x	
Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	LC	x	
Parulidae				
Black-and-white Warbler	<i>Mniotilta varia</i>	LC	x	
Black-cheeked Warbler	<i>Basileuterus melanogenys</i>	LC	x	
Black-throated Green Warbler	<i>Setophaga virens</i>	LC	x	
Collared Redstart	<i>Myioborus torquatus</i>	LC	x	
Costa Rican Warbler	<i>Basileuterus melanotis</i>	LC	x	
Flame-throated Warbler	<i>Oreothlypis gutturalis</i>	LC	x	
Northern Parula	<i>Setophaga americana</i>	LC	x	
Prothonotary Warbler	<i>Protonotaria citrea</i>	LC	x	
Slate-throated Redstart	<i>Myioborus miniatus</i>	LC	x	
Tennessee Warbler	<i>Oreothlypis peregrina</i>	LC	x	
Townsend's Warbler	<i>Setophaga townsendi</i>	LC	x	
Tropical Parula	<i>Setophaga pitayumi</i>	LC	x	
Wilson's Warbler	<i>Cardellina pusilla</i>	LC	x	
Thraupidae				
Bay-headed Tanager	<i>Tangara gyrola</i>	LC	x	
Blue-black Grassquit	<i>Volatinia jacarina</i>	LC	x	
Blue-gray Tanager	<i>Thraupis episcopus</i>	LC	x	
Buff-throated Saltator	<i>Saltator maximus</i>	LC	x	
Golden-hooded Tanager	<i>Tangara larvata</i>	LC	x	
Scarlet-thighed Dacnis	<i>Dacnis venusta</i>	LC	x	
Silver-throated Tanager	<i>Tangara icterocephala</i>	LC	x	

English Name	Scientific Name	IUCN Status ¹	IN Visual ²	IN Audio Only ³
<i>Thraupidae (cont'd)</i>				
Slaty Flowerpiercer	<i>Diglossa plumbea</i>	LC	x	
Spangle-cheeked Tanager	<i>Tangara dowii</i>	LC	x	
Speckled Tanager	<i>Tangara guttata</i>	LC		x
Yellow-faced Grassquit	<i>Tiaris olivacea</i>	LC	x	
<i>Emberizidae</i>				
Chestnut-capped Brush-Finch	<i>Arremon brunneinucha</i>	LC	x	
Common Chlorospingus	<i>Chlorospingus flavopectus</i>	LC	x	
Rufous-collared Sparrow	<i>Zonotrichia capensis</i>	LC	x	
Sooty-capped Chlorospingus	<i>Chlorospingus pileatus</i>	LC	x	
White-naped Brushfinch	<i>Atlapetes albinucha</i>	LC	x	
Yellow-thighed Finch	<i>Pselliophorus tibialis</i>	LC	x	
<i>Cardinalidae</i>				
Blue Seed eater	<i>Amaurospiza concolor</i>	LC	x	
Flame-colored Tanager	<i>Piranga bidentata</i>	LC	x	
Summer Tanager	<i>Piranga rubra</i>	LC	x	
White-winged Tanager	<i>Piranga leucoptera</i>	LC	x	
<i>Fringillidae</i>				
Elegant Euphonia	<i>Euphonia elegantissima</i>	LC	x	
Golden-browed Chlorophonia	<i>Chlorophonia callophrys</i>	LC	x	
Total Species			95	1

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, Magnificent Hummingbird prior to August 2017 (CLO 2017a).

4.2.3 ABUNDANCE

Point counts were only conducted between January and June. The number of point counts were not evenly distributed across the stations and ranged from 3 to 9 in total.

Overall, 577 birds were identified visually, inside the survey area during point counts in 2015 (Table 30) at an overall rate of 3.2/PC (Table 31). The stations with the highest overall abundance were 11 (6.1/PC), 20 (5.3/PC), and 32 (5.2/PC). The stations with the lowest abundance were 5 and 6 (1.0/PC); and 13, 27, 29 and 30 (1.3/PC). The habitat type with the highest overall abundance was P/NR<30 at 3.6/PC, followed by P at 3.3/PC. The lowest abundance was found in NR±30 at 1.3/PC (Table 33). Raw abundance by habitat type is shown in Table 32. The months with the highest overall abundance were April (4.5/PC) and February (4.0/PC), while the lowest were March (1.8/PC) and May (2.5/PC) (Tables 31 and 33).

Overall, the five most abundant species in 2015 were: Common Chlorospingus (3.92/10 PC), Slate-throated Redstart (2.98/10 PC), Sulphur-winged Parakeet (*Pyrrhura hoffmanni*) (2.27/10 PC), Northern Emerald-Toucanet (1.93/10 PC), and Silver-throated Tanager (1.77/10 PC) (Table 35). The two most abundant species at each station are highlighted in Table 35, 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 34.

Overall in 2015, New World Warblers (*Parulidae spp.*) was the most abundant family (5.80/10 PC), with New World Sparrows and Allies (*Emberizidae spp.*) the second most abundant (5.19/10 PC) (Table 35). The most abundant families at each station are highlighted in Table 35, with the most abundant family in red text and the 2nd most abundant in blue text. New World Warblers and New World Sparrows and Allies were the 1st or 2nd most abundant families in all the habitats, except for NR>30 where Toucans (*Ramphastidae spp.*) were the most abundant and P where Hummingbirds (*Tochilidae spp.*) were tied for 2nd most abundant (Table 36). New World Warblers were most abundant in NR<30 and NR±30, and 2nd most abundant in all other habitats. New World Sparrows and Allies were most abundant in P, P/NR<30, and OG and 2nd most abundant in NR<30 and NR±30.

Generally, Common Chlorospingus and Slate-throated Redstart were the two most abundant species in each habitat type (Table 36). Common Chlorospingus was most abundant in P, P/NR<30, NR<30, and OG and was tied for most abundant with Slate-throated Redstart in NR±30. Slate-throated Redstart was 2nd most abundant in P and NR<30, and tied for 2nd most abundant with Sulphur-winged Parakeet in P/NR<30, and Sulphur-winged Parakeet and Silver-throated Tanager in NR>30. In NR>30, Northern Emerald-Toucanet was most abundant, while Spotted Wood-quail (*Odontophorus guttatus*) was 2nd most abundant in OG. Several species were tied for 2nd most abundant in NR±30.

TABLE 30: Raw Bird Abundance By Station - 2015

Station	Jan	Feb	Mar	Apr	May	Jun	Total
1*	7	2		5		7	21
2		0		2		7	9
3*	0			8		8	16
4		1		4		3	8
5*	1					2	3
6		1	0			2	3
7*	0		4			2	6
9*	4	7	0		4	1	16
10	4	7	1		2	10	24
11	10	18	8		8	5	49
12*			1		5	0	6
13	4	3	0			2	9
14*	8	8	0	4		1	21
15*	6	9	11	4		6	36
16*	2	14	1	8		8	33
17*	10	13	2	5	3	5	38
18*	3	6	0	2	3	1	15
19*	16	0	2	8	2	5	33
20*	16	8			2	6	32
22*	2	9	2		1	5	19
24*	10	1	2		1	3	17
25*	8	3	7		3	17	38
26*	3	6	3		7	8	27
27*	4	0	2		1	1	8
28*	12	14	1		1	1	29
29	4	2	1		2	0	9
30*	2	2					4
31*	8	0	3	6	0	5	22
32*	17	6		3			26
Total	161	140	51	59	45	121	577

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 31: Bird Abundance Per Point Count By Station - 2015

Station	Jan	Feb	Mar	Apr	May	Jun	Overall	# Point Counts
1*	3.5	2.0		5.0		3.5	3.5	6
2		0.0		2.0		3.5	2.3	4
3*	0.0			8.0		4.0	3.2	5
4		1.0		4.0		1.5	2.0	4
5*	0.5					2.0	1.0	3
6		1.0	0.0			2.0	1.0	3
7*	0.0		4.0			2.0	1.5	4
9*	2.0	7.0	0.0		4.0	1.0	2.3	7
10	2.0	7.0	0.5		2.0	10.0	3.4	7
11	5.0	9.0	4.0		8.0	5.0	6.1	8
12*			1.0		2.5	0.0	1.5	4
13	4.0	1.5	0.0	0.0		1.0	1.3	7
14*	8.0	4.0	0.0	4.0		0.5	3.0	7
15*	6.0	4.5	11.0	4.0		3.0	5.1	7
16*	2.0	7.0	1.0	8.0		4.0	4.7	7
17*	3.3	6.5	2.0	5.0	3.0	5.0	4.2	9
18*	1.0	6.0	0.0	2.0	3.0	1.0	1.9	8
19*	5.3	0.0	2.0	8.0	2.0	5.0	4.1	8
20*	5.3	8.0			2.0	6.0	5.3	6
22*	2.0	4.5	1.0		1.0	2.5	2.4	8
24*	10.0	0.5	1.0		1.0	1.5	2.1	8
25*	8.0	1.5	3.5		3.0	8.5	4.8	8
26*	3.0	3.0	1.5		7.0	4.0	3.4	8
27*	2.0	0.0	2.0		1.0	1.0	1.3	6
28*	6.0	14.0	1.0		1.0	1.0	4.8	6
29	2.0	2.0	1.0		1.0	0.0	1.3	7
30*	1.0	2.0					1.3	3
31*	2.7	0.0	3.0	6.0	0.0	5.0	2.8	8
32*	5.7	6.0		3.0			5.2	5
Overall	3.4	4.0	1.8	4.5	2.5	3.1	3.2	
# Point Counts	48	35	28	6	18	39		181

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 32: Bird Abundance By Habitat - 2015

Habitat	# Stations	Jan	Feb	Mar	Apr	May	June	Total
P	7	36	19	13	22	1	29	120
P/NR<30	4	21	29	1	14	5	19	89
NR<30	11	70	47	26	19	18	55	235
NR>30	1	8	8	0	4		1	21
NR±30	1	4	2	1		2	0	9
OG	5	22	35	10	0	19	18	104
Total	29	161	140	51	59	45	122	578

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.

TABLE 33: Bird Abundance per Point Count By Habitat - 2015

Habitat	# Stations	Jan	Feb	Mar	Apr	May	Jun	Overall	# Point Counts
P	7	3.0	2.7	6.5	4.4	1.0	3.2	3.3	36
P/NR<30	4	3.0	5.8	0.5	4.7	2.5	3.0	3.6	25
NR<30	11	3.7	3.4	1.9	6.3	2.3	3.7	3.2	73
NR>30	1	8.0	4.0	0.0	4.0		0.5	3.0	7
NR±30	1	2.0	2.0	1.0		1.0	0.0	1.3	7
OG	5	3.1	5.8	1.3	0.0	3.8	3.0	3.2	33
Overall	29	3.4	4.0	1.8	4.5	2.5	3.1	3.2	
# Point Counts		48	35	28	6	18	39		181

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.

TABLE 34: Raw Bird Species Abundance by Station – 2015

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
Cracidae													1													1				2
Black Guan													1													1				2
Odontophoridae										11																		5		16
Spotted Wood-Quail										11																		5		16
Accipitridae															1															1
Barred Hawk															1															1
Apodidae																2														2
White-collared Swift																2														2
Trochilidae	7	2	1			1	1	1	1	3		2		6	2	1			5	3	1	2			1		3	3	2	48
Green Hermit												2																1	1	4
Green-crowned Brilliant	1																													1
Lesser Violetear	4	2													1															7
Purple-crowned Fairy																			1									1		2
Purple-throated Mountain-Gem	2									1									2											5
Rivoli's Hummingbird ¹															1															1
Rufous-tailed Hummingbird						1																								1
Scintillant Hummingbird										1				5								2					2			10
Snowy-bellied Hummingbird														1																1
Stripe-tailed Hummingbird																1									1			1		3
Violet Sabrewing			1					1																				1		3
White-tailed Emerald																				2										2
White-throated Mountain-gem							1		1	1									2	1	1								1	8
Columbidae								1						4				3							3					11
Band-tailed Pigeon														2																2
Chiriqui Quail-Dove														1																1
Gray-headed Dove																									3					3
Ruddy Pigeon								1						1				3												5
Psittacidae									1	4			2		5	8	4	2		5		4							6	41
Sulphur-winged Parakeet									1	4			2		5	8	4	2		5		4							6	41
Cuculidae					1											1	1				1									4
Squirrel Cuckoo					1											1	1				1									4
Trogonidae								1	2		1																			4
Collared Trogon								1																						1
Resplendent Quetzal									2		1																			3

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
Capitonidae										1		1		3	2	2	1	1		1	4	1			2				1	20
Red-headed Barbet										1		1		3	2	2	1	1		1	4	1			2				1	20
Ramphastidae				2					1	1	2	1	6			3		1	3					1	13	1				35
Northern Emerald-Toucanet				2					1	1	2	1	6			3		1	3					1	13	1				35
Picidae		1																			1									2
Hairy Woodpecker																					1									1
Red-crowned Woodpecker		1																												1
Furnariidae								1	3		1	3	1					1	1	1		5	2							19
Lineated Foliage-gleaner													1									1								2
Olivaceous Woodcreeper																		1												1
Red-faced Spinetail												2							1			1								4
Ruddy Treerunner									3														1							4
Spot-crowned Woodcreeper								1																						1
Spotted Barbtail												1										2	1							4
Streak-breasted Treehunter																				1		1								2
Streak-headed Woodcreeper											1																			1
Rhinocryptidae																2														2
Silvery-fronted Tapaculo																2														2
Tyrannidae			1	1				6		1				2	4	1		1	2	2	2		4	1	1			1		30
Black-capped Flycatcher															1															1
Boat-billed Flycatcher																			1											1
Golden-bellied Flycatcher								1											1					1						3
Paltry Tyrannulet															3			1			1									5
Slaty-capped Flycatcher																1														1
Social Flycatcher										1																				1
Tufted Flycatcher				1				5															1					1		8
Yellow-bellied Flycatcher														1																1
Yellowish Flycatcher			1											1						2	1		3		1					9
Tityridae																					1									1
Barred Becard																					1									1
Corvidae																								1						1
Brown Jay																								1						1
Turdidae	1		2					2	1	5			1			1	1	1												15
Black-faced Solitaire									1	3								1												5
Clay-colored Thrush								1																						1
Mountain Thrush								1		2							1													4
Ruddy-capped Nightingale-Thrush	1		1														1													3

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
<i>Turdidae (cont'd)</i>																														
Swainson's Thrush			1										1																	2
<i>Troglodytidae</i>		1														2	1		1	6		5	2							18
Gray-breasted Wood-Wren																2	1		1	6		4	1							15
House Wren		1																												1
Rufous-breasted Wren																						1	1							2
<i>Vireonidae</i>													2	5	5		1								1	1	1			16
Brown-capped Vireo													1		3											1				5
Philadelphia Vireo													1	2	2										1		1			7
Rufous-browed Peppershrike														3			1													4
<i>Parulidae</i>	2			2	1	1	1	2	6	6	1	1	4	10	2	3	1	10	10		6	9	5	3	2	4		7	6	105
Black-and-white Warbler																			1						1	1				3
Black-cheeked Warbler								1	5	1												1								8
Black-throated Green Warbler														1												1		1		3
Collared Redstart							1			2									2		1									6
Costa Rican Warbler																						4	1					1	3	9
Flame-throated Warbler									1																					1
Northern Parula																		1												1
Prothonotary Warbler													1						1				1							3
Slate-throated Redstart	2			1	1	1				3	1	1	2	4	1	2	1	8	6		3	3	3	1	1	2		4	3	54
Tennessee Warbler																1														1
Townsend's Warbler														3	1							1								5
Tropical Parula																					1									1
Wilson's Warbler				1				1					1	2				1			1			2				1		10
<i>Thraupidae</i>		1	12				2		4	8			3	1	1	2	2	5	5		1	3	7	1	4			4		66
Bay-headed Tanager			2																		1		1							4
Blue-black Grassquit																						1								1
Blue-gray Tanager			5																											5
Buff-throated Saltator															1															1
Golden-hooded Tanager																							2							2
Scarlet-thighed Dacnis													1									1	1	1	4					8
Silver-throated Tanager							2		1	4			2	1		2	2	5	5			1	3					4		32
Slaty Flowerpiercer		1	1																											2
Spangle-cheeked Tanager									3	4																				7
Yellow-faced Grassquit			4																											4
<i>Emberizidae</i>	11	1		3	1	1	2	2	4	9	1	1		4	9	6	2	8	4	1	1	5	5			2		2	9	85
Chestnut-capped Brush-Finch														1		1			1											3

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
<i>Emberizidae (cont'd)</i>																														
Common Chlorospingus	10			3	1		2	2	2	7	1	1			4	5	2	8	3	1	1	4	5			2		2	5	71
Rufous-collared Sparrow		1																												1
Sooty-capped Chlorospingus										2																				2
White-naped Brushfinch															4															4
Yellow-thighed Finch	1					1			2					3	1							1							4	13
<i>Cardinalidae</i>		3											1			3	1		1			3	2		1				1	16
Blue Seed eater																							2							2
Flame-colored Tanager		3															1								1				1	6
Summer Tanager																						3								3
White-winged Tanager													1			3			1											5
<i>Fringillidae</i>									1					1	2	1									1	1			1	8
Elegant Euphonia															2	1								1	1				1	6
Golden-browed Chlorophonia									1					1																2

1, Magnificent Hummingbird prior to August 2017 (CLO 2017a). *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 35: Bird Species Abundance Per 10 Point Counts by Station – 2015

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
# Point Counts	6	4	5	4	3	3	4	7	7	8	4	7	7	7	7	9	8	8	6	8	8	8	8	6	6	7	3	8	5	181
Cracidae													1.4													1.4				0.11
Black Guan													1.4													1.4				0.11
Odontophoridae										13.8																		6.3		0.88
Spotted Wood-Quail										13.8																		6.3		0.88
Accipitridae															1.4															0.06
Barred Hawk															1.4															0.06
Apodidae																2.2														0.11
White-collared Swift																2.2														0.11
Trochilidae	11.7	5.0	2.0			3.3	2.5	1.4	1.4	3.8		2.9		8.6	2.9	1.1			8.3	3.8	1.3	2.5			1.7		10.0	3.8	4.0	2.65
Green Hermit												2.9																1.3	2.0	0.22
Green-crowned Brilliant	1.7																													0.06
Lesser Violetear	6.7	5.0													1.4															0.39
Purple-crowned Fairy																			1.7									1.3		0.11
Purple-throated Mountain-Gem	3.3									1.3									3.3											0.28
Rivoli's Hummingbird¹															1.4															0.06
Rufous-tailed Hummingbird						3.3																								0.06
Scintillant Hummingbird										1.3				7.1								2.5					6.7			0.55
Snowy-bellied Hummingbird														1.4																0.06
Stripe-tailed Hummingbird																1.1									1.7			1.3		0.17
Violet Sabrewing			2.0					1.4																			3.3			0.17
White-tailed Emerald																				2.5										0.11
White-throated Mountain-gem							2.5		1.4	1.3									3.3	1.3	1.3								2.0	0.44
Columbidae								1.4						5.7				3.8								5.0				0.61
Band-tailed Pigeon														2.9																0.11
Chiriqui Quail-Dove														1.4																0.06
Gray-headed Dove																									5.0					0.17
Ruddy Pigeon								1.4						1.4				3.8												0.28
Psittacidae									1.4	5.0			2.9		7.1	8.9	5.0	2.5		6.3		5.0							12.0	2.27
Sulphur-winged Parakeet									1.4	5.0			2.9		7.1	8.9	5.0	2.5		6.3		5.0							12.0	2.27
Cuculidae					3.3											1.1	1.3				1.3									0.22
Squirrel Cuckoo					3.3											1.1	1.3				1.3									0.22
Trogonidae								1.4	2.9		2.5																			0.22
Collared Trogon								1.4																						0.06
Resplendent Quetzal									2.9		2.5																			0.17

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
Capitonidae										1.3		1.4		4.3	2.9	2.2	1.3	1.3		1.3	5.0	1.3			3.3				2.0	1.10
Red-headed Barbet										1.3		1.4		4.3	2.9	2.2	1.3	1.3		1.3	5.0	1.3			3.3				2.0	1.10
Ramphastidae				5.0					1.4	1.3	5.0	1.4	8.6			3.3		1.3	5.0					1.7	21.7	1.4				1.93
Northern Emerald-Toucanet				5.0					1.4	1.3	5.0	1.4	8.6			3.3		1.3	5.0					1.7	21.7	1.4				1.93
Picidae		2.5																			1.3									0.11
Hairy Woodpecker																					1.3									0.06
Red-crowned Woodpecker		2.5																												0.06
Furnariidae								1.4	4.3		2.5	4.3	1.4					1.3	1.7	1.3		6.3	2.5							1.05
Lineated Foliage-gleaner													1.4									1.3								0.11
Olivaceous Woodcreeper																		1.3												0.06
Red-faced Spinetail												2.9							1.7			1.3								0.22
Ruddy Treerunner									4.3														1.3							0.22
Spot-crowned Woodcreeper								1.4																						0.06
Spotted Barbtail												1.4										2.5	1.3							0.22
Streak-breasted Treehunter																				1.3		1.3								0.11
Streak-headed Woodcreeper											2.5																			0.06
Rhinocryptidae																2.2														0.11
Silvery-fronted Tapaculo																2.2														0.11
Tyrannidae			2.0	2.5				8.6		1.3				2.9	5.7	1.1		1.3	3.3	2.5	2.5		5.0	1.7	1.7			1.3		1.66
Black-capped Flycatcher															1.4															0.06
Boat-billed Flycatcher																			1.7											0.06
Golden-bellied Flycatcher								1.4											1.7					1.7						0.17
Paltry Tyrannulet															4.3			1.3			1.3									0.28
Slaty-capped Flycatcher																1.1														0.06
Social Flycatcher										1.3																				0.06
Tufted Flycatcher				2.5				7.1															1.3					1.3		0.44
Yellow-bellied Flycatcher														1.4																0.06
Yellowish Flycatcher			2.0											1.4						2.5	1.3		3.8		1.7					0.50
Tityridae																						1.3								0.06
Barred Becard																						1.3								0.06
Corvidae																								1.7						0.06
Brown Jay																								1.7						0.06
Turdidae	1.7		4.0					2.9	1.4	6.3			1.4			1.1	1.3	1.3												0.83
Black-faced Solitaire									1.4	3.8								1.3												0.28
Clay-colored Thrush								1.4																						0.06
Mountain Thrush								1.4		2.5						1.1														0.22
Ruddy-capped Nightingale-Thrush	1.7		2.0																											0.17

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
<i>Turdidae (cont'd)</i>																														
Swainson's Thrush			2.0										1.4				1.3													0.11
<i>Troglodytidae</i>		2.5														2.2	1.3		1.7	7.5		6.3	2.5							0.99
Gray-breasted Wood-Wren																2.2	1.3		1.7	7.5		5.0	1.3							0.83
House Wren		2.5																												0.06
Rufous-breasted Wren																						1.3	1.3							0.11
<i>Vireonidae</i>													2.9	7.1	7.1		1.3								1.7	1.4	3.3			0.88
Brown-capped Vireo													1.4		4.3											1.4				0.28
Philadelphia Vireo													1.4	2.9	2.9										1.7		3.3			0.39
Rufous-browed Peppershrike														4.3			1.3													0.22
<i>Parulidae</i>	3.3			5.0	3.3	3.3	2.5	2.9	8.6	7.5	2.5	1.4	5.7	14.3	2.9	3.3	1.3	12.5	16.7		7.5	11.3	6.3	5.0	3.3	5.7		8.8	12.0	5.80
Black-and-white Warbler																			1.7						1.7	1.4				0.17
Black-cheeked Warbler								1.4	7.1	1.3											1.3									0.44
Black-throated Green Warbler														1.4												1.4		1.3		0.17
Collared Redstart							2.5			2.5									3.3		1.3									0.33
Costa Rican Warbler																						5.0	1.3					1.3	6.0	0.50
Flame-throated Warbler									1.4																					0.06
Northern Parula																		1.3												0.06
Prothonotary Warbler													1.4						1.7				1.3							0.17
Slate-throated Redstart	3.3			2.5	3.3	3.3				3.8	2.5	1.4	2.9	5.7	1.4	2.2	1.3	10.0	10.0		3.8	3.8	3.8	1.7	1.7	2.9		5.0	6.0	2.98
Tennessee Warbler																1.1														0.06
Townsend's Warbler														4.3	1.4							1.3								0.28
Tropical Parula																					1.3									0.06
Wilson's Warbler				2.5				1.4					1.4	2.9				1.3			1.3			3.3				1.3		0.55
<i>Thraupidae</i>		2.5	24.0				5.0		5.7	10.0			4.3	1.4	1.4	2.2	2.5	6.3	8.3		1.3	3.8	8.8	1.7	6.7			5.0		3.65
Bay-headed Tanager			4.0																		1.3		1.3							0.22
Blue-black Grassquit																						1.3								0.06
Blue-gray Tanager			10.0																											0.28
Buff-throated Saltator															1.4															0.06
Golden-hooded Tanager																							2.5							0.11
Scarlet-thighed Dacnis													1.4									1.3	1.3	1.7	6.7					0.44
Silver-throated Tanager							5.0		1.4	5.0			2.9	1.4		2.2	2.5	6.3	8.3			1.3	3.8					5.0		1.77
Slaty Flowerpiercer		2.5	2.0																											0.11
Spangle-checked Tanager									4.3	5.0																				0.39
Yellow-faced Grassquit			8.0																											0.22
<i>Emberizidae</i>	18.3	2.5		7.5	3.3	3.3	5.0	2.9	5.7	11.3	2.5	1.4		5.7	12.9	6.7	2.5	10.0	6.7	1.3	1.3	6.3	6.3			2.9		2.5	18.0	5.19
Chestnut-capped Brush-Finch														1.4		1.1			1.7											0.17

Station	1*	2	3*	4	5*	6	7*	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
<i>Emberizidae (cont'd)</i>																														
Common Chlorospingus	16.7			7.5	3.3		5.0	2.9	2.9	8.8	2.5	1.4			5.7	5.6	2.5	10.0	5.0	1.3	1.3	5.0	6.3			2.9		2.5	10.0	3.92
Rufous-collared Sparrow		2.5																												0.06
Sooty-capped Chlorospingus										2.5																				0.11
White-naped Brushfinch															5.7															0.22
Yellow-thighed Finch	1.7					3.3			2.9					4.3	1.4							1.3							8.0	0.72
<i>Cardinalidae</i>		7.5											1.4			3.3	1.3		1.7			3.8	2.5		1.7				2.0	0.88
Blue Seedeater																							2.5							0.11
Flame-colored Tanager		7.5															1.3								1.7				2.0	0.33
Summer Tanager																						3.8								0.17
White-winged Tanager													1.4			3.3			1.7											0.28
<i>Fringillidae</i>									1.4					1.4	2.9	1.1								1.7	1.7				2.0	0.44
Elegant Euphonia															2.9	1.1								1.7	1.7				2.0	0.33
Golden-browed Chlorophonia									1.4					1.4																0.11
<i>Species Richness</i>	7	6	8	5	3	3	4	11	13	17	5	7	13	18	16	17	10	12	16	8	12	20	15	7	11	7	3	11	10	95

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.

1, Magnificent Hummingbird prior to August 2017 (CLO 2017a). *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 36: Bird Species Abundance Per 10 Point Counts by Habitat – 2015

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Overall
# Point Counts	36	25	73	7	7	33	181
Cracidae				1.4	1.4		0.11
Black Guan				1.4	1.4		0.11
Odontophoridae			0.7			3.3	0.88
Spotted Wood-Quail			0.7			3.3	0.88
Accipitridae		0.4					0.06
Barred Hawk		0.4					0.06
Apodidae			0.3				0.11
White-collared Swift			0.3				0.11
Trochilidae	5.8	2.8	1.8			2.1	2.65
Green Hermit	0.3		0.1			0.6	0.22
Green-crowned Brilliant	0.3						0.06
Lesser Violetear	1.7	0.4					0.39
Purple-crowned Fairy		0.4	0.1				0.11
Purple-throated Mountain-Gem	0.6	0.8				0.3	0.28
Rivoli's Hummingbird ¹		0.4					0.06
Rufous-tailed Hummingbird			0.1				0.06
Scintillant Hummingbird	1.9		0.3			0.3	0.55
Snowy-bellied Hummingbird	0.3						0.06
Stripe-tailed Hummingbird			0.4				0.17
Violet Sabrewing	0.6					0.3	0.17
White-tailed Emerald			0.3				0.11
White-throated Mountain-gem	0.3	0.8	0.4			0.6	0.44
Columbidae	1.1		0.8			0.3	0.61
Band-tailed Pigeon	0.6						0.11
Chiriqui Quail-Dove	0.3						0.06
Gray-headed Dove			0.4				0.17
Ruddy Pigeon	0.3		0.4			0.3	0.28
Psittacidae	1.7	3.6	2.6	2.9		1.5	2.27
Sulphur-winged Parakeet	1.7	3.6	2.6	2.9		1.5	2.27
Cuculidae		0.4	0.4				0.22
Squirrel Cuckoo		0.4	0.4				0.22
Cuculidae						1.2	0.22
Collared Trogon						0.3	0.06
Resplendent Quetzal						0.9	0.17
Capitonidae	1.1	1.2	1.5			0.6	1.10
Red-headed Barbet	1.1	1.2	1.5			0.6	1.10
Ramphastidae	0.3	2.0	2.3	8.6	1.4	1.5	1.93
Northern Emerald-Toucanet	0.3	2.0	2.3	8.6	1.4	1.5	1.93
Picidae	0.3		0.1				0.11
Hairy Woodpecker			0.1				0.06
Red-crowned Woodpecker	0.3						0.06
Furnariidae		0.4	1.2	1.4		2.4	1.05
Lineated Foliage-gleaner			0.1	1.4			0.11
Olivaceous Woodcreeper			0.1				0.06
Red-faced Spinetail		0.4	0.1			0.6	0.22
Ruddy Treerunner			0.1			0.9	0.22
Spot-crowned Woodcreeper						0.3	0.06
Spotted Barbtail			0.4			0.3	0.22

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Overall
<i>Furnariidae (cont'd)</i>							
Streak-breasted Treehunter			0.3				0.11
Streak-headed Woodcreeper						0.3	0.06
<i>Rhinocryptidae</i>			0.3				0.11
Silvery-fronted Tapaculo			0.3				0.11
<i>Tyrannidae</i>	1.1	2.8	1.6			2.1	1.66
Black-capped Flycatcher		0.4					0.06
Boat-billed Flycatcher		0.4					0.06
Golden-bellied Flycatcher	0.3	0.4				0.3	0.17
Paltry Tyrannulet		1.2	0.3				0.28
Slaty-capped Flycatcher			0.1				0.06
Social Flycatcher						0.3	0.06
Tufted Flycatcher		0.4	0.3			1.5	0.44
Yellow-bellied Flycatcher	0.3						0.06
Yellowish Flycatcher	0.6		1.0				0.50
<i>Tityridae</i>			0.1				0.06
Barred Becard			0.1				0.06
<i>Corvidae</i>	0.3						0.06
Brown Jay	0.3						0.06
<i>Turdidae</i>	0.8	0.4	0.3	1.4		2.4	0.83
Black-faced Solitaire			0.1			1.2	0.28
Clay-colored Thrush						0.3	0.06
Mountain Thrush			0.1			0.9	0.22
Ruddy-capped Nightingale-Thrush	0.6	0.4					0.17
Swainson's Thrush	0.3			1.4			0.11
<i>Troglodytidae</i>	0.3	0.8	2.1				0.99
Gray-breasted Wood-Wren		0.8	1.8				0.83
House Wren	0.3						0.06
Rufous-breasted Wren			0.3				0.11
<i>Vireonidae</i>	1.7	2.4	0.1	2.9	1.4		0.88
Brown-capped Vireo		1.2		1.4	1.4		0.28
Philadelphia Vireo	0.8	0.8	0.1	1.4			0.39
Rufous-browed Peppershrike	0.8	0.4					0.22
<i>Parulidae</i>	5.8	6.0	6.2	5.7	5.7	4.8	5.80
Black-and-white Warbler		0.4	0.1		1.4		0.17
Black-cheeked Warbler			0.1			2.1	0.44
Black-throated Green Warbler	0.3		0.1		1.4		0.17
Collared Redstart		0.8	0.3			0.6	0.33
Costa Rican Warbler	0.8		0.8				0.50
Flame-throated Warbler						0.3	0.06
Northern Parula			0.1				0.06
Prothonotary Warbler		0.4	0.1	1.4			0.17
Slate-throated Redstart	2.8	3.6	3.6	2.9	2.9	1.5	2.98
Tennessee Warbler			0.1				0.06
Townsend's Warbler	0.8	0.4	0.1				0.28
Tropical Parula			0.1				0.06
Wilson's Warbler	1.1	0.4	0.4	1.4		0.3	0.55
<i>Thraupidae</i>	4.2	3.2	3.8	4.3		3.6	3.65
Bay-headed Tanager	0.6		0.3				0.22
Blue-black Grassquit			0.1				0.06
Blue-gray Tanager	1.4						0.28
Buff-throated Saltator		0.4					0.06

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Overall
<i>Thraupidae (cont'd)</i>							
Golden-hooded Tanager			0.3				0.11
Scarlet-thighed Dacnis	0.3		0.8	1.4			0.44
Silver-throated Tanager	0.3	2.8	2.3	2.9		1.5	1.77
Slaty Flowerpiercer	0.6						0.11
Spangle-checked Tanager						2.1	0.39
Yellow-faced Grassquit	1.1						0.22
<i>Emberizidae</i>	6.9	7.2	4.4		2.9	5.2	5.19
Chestnut-capped Brush-Finch	0.3	0.4	0.1				0.17
Common Chlorospingus	4.2	4.8	4.0		2.9	3.9	3.92
Rufous-collared Sparrow	0.3						0.06
Sooty-capped Chlorospingus						0.6	0.11
White-naped Brushfinch		1.6					0.22
Yellow-thighed Finch	2.2	0.4	0.3			0.6	0.72
<i>Cardinalidae</i>	1.1	0.8	1.2	1.4			0.88
Blue Seedeater			0.3				0.11
Flame-colored Tanager	1.1	0.4	0.1				0.33
Summer Tanager			0.4				0.17
White-winged Tanager		0.4	0.4	1.4			0.28
<i>Fringillidae</i>	0.8	0.8	0.3			0.3	0.44
Elegant Euphonia	0.6	0.8	0.3				0.33
Golden-browed Chlorophonia	0.3					0.3	0.11

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.

1, Magnificent Hummingbird prior to August 2017 (CLO 2017a).

4.2.3.2 THREATENED SPECIES ABUNDANCE

4.2.3.2.1 BLACK GUAN

Black Guan had an overall abundance of 0.11/10 PC (Table 35). They were found at Stations 14 (NR>30) and 29 (NR±30) at an abundance of 1.4/10 PC.

4.2.3.2.2 RESPLENDENT QUETZAL

During point counts, Resplendent Quetzal had an overall abundance of 0.17/10 PC (Table 35). They were identified visually at Stations 10 and 12 with abundances of 2.9 and 2.5/10 PC, respectively. Both stations were OG habitat. Five (5) other Resplendent Quetzals were identified by their calls at Stations 7 (NR>30), 9 (OG), and 13 (OG).

4.2.3.2.3 RUDDY PIGEON

Ruddy Pigeon had an overall abundance of 0.28/10 PC (Table 35). They were found at 3 stations (9, 15, and 19), were most abundant at Station 19 (3.8/10 PC), and lower in abundance at stations 9 and 15 (1.4/10 PC). Ruddy Pigeon were primarily found at similar abundances in P, NR<30, and OG (0.3 or 0.4/10 PC) and not found at all in the other habitats (Table 36).

4.2.4 RICHNESS & DIVERSITY

Overall, 95 bird species from 25 families were identified during point count surveys with, in total, 0.52 species identified per point count (Table 37). The highest species richness was found at stations 20 (2.67 species/point count), 15 (2.57 species/point count), and 25 (2.50 species/point count). The lowest species richness was found at stations 5, 6, 7, 13, 22, 29, and 30 (1.00 species/point count). Looking at habitats, the highest species richness was found in NR>30 (1.86 species/point count), and the lowest in NR±30 (1.00 species/point count) (Table 38).

Overall, SID was 0.959 (Table 37). The highest SIDs were found at stations 5 and 6 (1.000), 27 (0.964), and 25 (0.954), while the lowest were found at stations 1 (0.748), 28 (0.783), and 30 (0.833). Looking at habitats, the highest SID was found in P (0.960) and the lowest in NR>30 (0.914) (Table 38). 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 37: Richness and Diversity By Station - 2015

Station	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
1*	6	4	7	1.17	0.748
2	4	6	6	1.50	0.889
3*	5	4	8	1.60	0.858
4	4	4	5	1.25	0.857
5*	3	3	3	1.00	1.000
6	3	3	3	1.00	1.000
7*	4	4	4	1.00	0.867
9*	7	8	11	1.57	0.908
10	7	10	13	1.86	0.931
11	8	10	17	2.13	0.912
12*	4	5	5	1.25	0.933
13	7	6	7	1.00	0.944
14*	7	9	13	1.86	0.914
15*	7	9	18	2.57	0.951
16*	7	10	16	2.29	0.941
17*	9	15	17	1.89	0.929
18*	8	10	10	1.25	0.924
19*	8	10	12	1.50	0.867
20*	6	9	16	2.67	0.931
22*	8	7	8	1.00	0.842
24*	8	8	12	1.50	0.934
25*	8	10	20	2.50	0.954
26*	8	7	15	1.88	0.940
27*	6	6	7	1.17	0.964
28*	6	10	11	1.83	0.783
29	7	5	7	1.00	0.944
30*	3	2	3	1.00	0.833
31*	8	6	11	1.38	0.900
32*	5	7	10	2.00	0.886
Overall	181	25	95	0.52	0.959

1, Simpson's Index of Diversity. *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 38: Richness and Diversity By Habitat - 2015

Habitat	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ²
P	36	16	42	1.17	0.960
P/NR<30	25	16	36	1.44	0.950
NR<30	73	21	58	0.79	0.949
NR>30	7	9	13	1.86	0.914
NR±30	7	5	7	1.00	0.944
OG	33	14	34	1.03	0.954
Overall	181	25	95	0.52	0.959

1, Simpson's Index of Diversity.

4.3 2014

4.3.1 SPECIES IDENTIFIED

Overall, 98 unique bird species were identified during point count surveys in 2014 (Table 39). Of those, 97 were identified visually and 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. One species was identified only by its song inside the survey area, Gray-Cowled Wood-Rail (*Aramides cajaneus*).

4.3.1.1 THREATENED SPECIES

Five (5) species on the IUCN Redlist of Threatened Species (www.iucnredlist.org) were identified during the survey period (Table 39). Of these, the Ruddy Pigeon is considered Vulnerable (VU). The other four are considered Near Threatened (NT): Black Guan, Ornate Hawk-Eagle, Resplendent Quetzal, and Golden-winged Warbler.

TABLE 39: Bird Species Identified, All Methods – 2014

English name	Scientific Name	IUCN Status ¹	IN Visual ²	IN Audio Only ³
Cracidae				
Black Guan	<i>Chamaepetes unicolor</i>	NT	x	
Odontophoridae				
Spotted Wood-Quail	<i>Odontophorus guttatus</i>	LC	x	
Rallidae				
Gray-Cowled Wood-Rail	<i>Aramides cajaneus</i>	LC		x
Cathartidae				
Black Vulture	<i>Coragyps atratus</i>	LC	x	
Accipitridae				
Ornate Hawk-Eagle	<i>Spizaetus ornatus</i>	NT	x	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	LC	x	
Trochilidae				
Fiery-throated Hummingbird	<i>Panterpe insignis</i>	LC	x	
Green Hermit	<i>Phaethornis guy</i>	LC	x	
Green-crowned Brilliant	<i>Heliodoxa jacula</i>	LC	x	
Green-fronted Lancebill	<i>Doryfera ludovicae</i>	LC	x	
Lesser Violetear	<i>Colibri cyanotus</i>	LC	x	
Purple-throated Mountain-Gem	<i>Lampornis calolaemus</i>	LC	x	
Rivoli's Hummingbird ⁴	<i>Eugenes fulgens</i>	LC	x	
Rufous-tailed Hummingbird	<i>Amazilia tzacatl</i>	LC	x	
Scintillant Hummingbird	<i>Selasphorus scintilla</i>	LC	x	
Steely-vented Hummingbird	<i>Amazilia saucerrottei</i>	LC	x	
Stripe-tailed Hummingbird	<i>Eupherusa eximia</i>	LC	x	
Violet Sabrewing	<i>Campylopterus hemileucurus</i>	LC	x	
White-tailed Emerald	<i>Ehira chionura</i>	LC	x	
White-throated Mountain-gem	<i>Lampornis castaneiventris</i>	LC	x	
Columbidae				
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	LC	x	
Buff-fronted Quail-Dove	<i>Zentrygon costaricensis</i>	LC	x	
Chiriqui Quail-Dove	<i>Zentrygon chiriquensis</i>	LC	x	
Ruddy Pigeon	<i>Patagioenas subvinacea</i>	VU	x	
White-tipped Dove	<i>Leptotila verreauxi</i>	LC	x	
Psittacidae				
Sulphur-winged Parakeet	<i>Pyrrhura hoffmanni</i>	LC	x	
Cuculidae				
Squirrel Cuckoo	<i>Piaya cayana</i>	LC	x	
Trogonidae				
Collared Trogon	<i>Trogon collaris</i>	LC	x	
Resplendent Quetzal	<i>Pharomacrus mocinno</i>	NT	x	
Capitonidae				
Red-headed Barbet	<i>Enbucco bourcierii</i>	LC	x	
Ramphastidae				
Northern Emerald-Toucanet	<i>Anlacorhynchus prasinus</i>	LC	x	
Picidae				
Hairy Woodpecker	<i>Picoides villosus</i>	LC	x	
Furnariidae				
Plain Xenops	<i>Xenops minutus</i>	LC	x	
Ruddy Treerunner	<i>Margarornis rubiginosus</i>	LC	x	
Spot-crowned Woodcreeper	<i>Lepidocolaptes affinis</i>	LC	x	
Spotted Woodcreeper	<i>Xiphorhynchus erythropygius</i>	LC	x	
Streak-breasted Treehunter	<i>Thripadectes rufobrunneus</i>	LC	x	

English name	Scientific Name	IUCN Status ¹	IN Visual ²	IN Audio Only ³
Furnariidae (cont'd)				
Wedge-billed Woodcreeper	<i>Glyphorhynchus spirurus</i>	LC	x	
Tyrannidae				
Black Phoebe	<i>Sayornis nigricans</i>	LC	x	
Dark Pewee	<i>Contopus lugubris</i>	LC	x	
Eastern Wood-Pewee	<i>Contopus virens</i>	LC	x	
Golden-bellied Flycatcher	<i>Myiodynastes bemicchrysus</i>	LC	x	
Mountain Elaenia	<i>Elaenia frantzii</i>	LC	x	
Ochraceous Pewee	<i>Contopus ochraceus</i>	LC	x	
Olive-striped Flycatcher	<i>Mionectes olivaceus</i>	LC	x	
Paltry Tyrannulet	<i>Zimmerius vilissimus</i>	LC	x	
Slaty-capped Flycatcher	<i>Leptopogon superciliosus</i>	LC	x	
Tufted Flycatcher	<i>Mitrephanes phaeocercus</i>	LC	x	
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	LC	x	
Yellowish Flycatcher	<i>Empidonax flavescens</i>	LC	x	
Tityridae				
Barred Becard	<i>Pachyrhamphus versicolor</i>	LC	x	
Corvidae				
Brown Jay	<i>Psittorhynchus morio</i>	LC	x	
Turdidae				
Black-faced Solitaire	<i>Myadestes melanops</i>	LC	x	
Clay-colored Thrush	<i>Turdus grayi</i>	LC	x	
Mountain Thrush	<i>Turdus plebejus</i>	LC	x	
Ruddy-capped Nightingale-Thrush	<i>Catharus frantzii</i>	LC	x	
Slaty-backed Nightingale-thrush	<i>Catharus fuscater</i>	LC	x	
Sooty Thrush	<i>Turdus nigrescens</i>	LC	x	
Cinclidae				
American Dipper	<i>Cinclus mexicanus</i>	LC	x	
Troglodytidae				
Gray-breasted Wood-Wren	<i>Henicorbina leucophrys</i>	LC	x	
Vireonidae				
Brown-capped Vireo	<i>Vireo leucophrys</i>	LC	x	
Philadelphia Vireo	<i>Vireo philadelphicus</i>	LC	x	
Yellow-winged Vireo	<i>Vireo carmioli</i>	LC	x	
Parulidae				
Black-and-white Warbler	<i>Mniotilta varia</i>	LC	x	
Black-cheeked Warbler	<i>Basileuterus melanogenys</i>	LC	x	
Black-throated Green Warbler	<i>Setophaga virens</i>	LC	x	
Blackburnian Warbler	<i>Setophaga fusca</i>	LC	x	
Collared Redstart	<i>Myioborus torquatus</i>	LC	x	
Costa Rican Warbler	<i>Basileuterus melanotis</i>	LC	x	
Flame-throated Warbler	<i>Oreothlypis gutturalis</i>	LC	x	
Golden-crowned Warbler	<i>Basileuterus culicivorus</i>	LC	x	
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	NT	x	
Kentucky Warbler	<i>Geothlypis formosa</i>	LC	x	
Prothonotary Warbler	<i>Protonotaria citrea</i>	LC	x	
Slate-throated Redstart	<i>Myioborus miniatus</i>	LC	x	
Tennessee Warbler	<i>Oreothlypis peregrina</i>	LC	x	
Townsend's Warbler	<i>Setophaga townsendi</i>	LC	x	
Tropical Parula	<i>Setophaga pitiauyumi</i>	LC	x	
Wilson's Warbler	<i>Cardellina pusilla</i>	LC	x	

English name	Scientific Name	IUCN Status ¹	IN Visual ²	IN Audio Only ³
Thraupidae				
Bay-headed Tanager	<i>Tangara gyrola</i>	LC	x	
Blue Dacnis	<i>Dacnis cayana</i>	LC	x	
Blue-gray Tanager	<i>Thraupis episcopus</i>	LC	x	
Cherrie's Tanager	<i>Ramphocelus costaricensis</i>	LC	x	
Scarlet-thighed Dacnis	<i>Dacnis venusta</i>	LC	x	
Silver-throated Tanager	<i>Tangara icterocephala</i>	LC	x	
Slaty Flowerpiercer	<i>Diglossa plumbea</i>	LC	x	
Yellow-faced Grassquit	<i>Tiaris olivacea</i>	LC	x	
Emberizidae				
Chestnut-capped Brush-Finch	<i>Arremon brunneinucha</i>	LC	x	
Common Chlorospingus	<i>Chlorospingus flavopectus</i>	LC	x	
Sooty-capped Chlorospingus	<i>Chlorospingus pileatus</i>	LC	x	
White-naped Brushfinch	<i>Atlapetes albinucha</i>	LC	x	
Yellow-thighed Finch	<i>Pselliophorus tibialis</i>	LC	x	
Cardinalidae				
Flame-colored Tanager	<i>Piranga bidentata</i>	LC	x	
Hepatic Tanager	<i>Piranga flava</i>	LC	x	
Summer Tanager	<i>Piranga rubra</i>	LC	x	
White-winged Tanager	<i>Piranga leucoptera</i>	LC	x	
Icteridae				
Baltimore Oriole	<i>Icterus galbula</i>	LC	x	
Fringillidae				
Elegant Euphonia	<i>Euphonia elegantissima</i>	LC	x	
Total Species			97	1

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, Magnificent Hummingbird prior to August 2017 (CLO 2017a).

4.3.3 ABUNDANCE

Point counts were only conducted in January, February, April, May, June, October, November and December and not all stations or habitat types were surveyed each month. The number of point counts were not evenly distributed across the stations and ranged from 3 to 12 in total.

Overall, 774 birds were identified visually, inside the survey area during point counts in 2014 (Table 40) at an overall rate of 3.6/PC (Table 41). The stations with the highest overall abundance were 28 (8.6/PC), 27 (7.6/PC), and 20 (6.3/PC). The stations with the lowest abundance were 6 (0.3/PC), 2 (0.7/PC), and 9 (1.0/PC). The habitat type with the highest overall abundance was NR>30 at 5.7/PC. The lowest abundance was found in NR±30 at 1.3/PC (Table 43). Raw abundance by habitat type is shown in Table 43. The months with the highest overall abundance were May (5.6/PC) and January (4.0/PC), while the lowest were April (1.0/PC) (only NR<30 was surveyed in April) and November (2.7/PC) (Tables 41 and 43).

Overall in 2014, New World Warblers (*Parulidae spp.*) was the most abundant family (7.37/10 PC), with New World Sparrows and Allies (*Emberizidae spp.*) the second most abundant (6.48/10 PC) (Table 45). The most abundant families at each station are highlighted in Table 45, with the most abundant family in red text and the 2nd most abundant in blue text. True Parrots (*Psittacidae spp.*) were the most abundant family in P, P/NR<30, and NR±30 (Table 46). New World Warblers were the most abundant in NR<30, NR>30 and OG, and the 2nd most abundant in P/NR<30. New World Sparrows and Allies were the 2nd most abundant family in P, NR>30, NR±30, and OG. Hummingbirds (*Trochilidae spp.*) were the 2nd most abundant family in NR<30.

Overall, the five most abundant species in 2014 were: Sulphur-winged Parakeet (6.43/10 PC), Common Chlorospingus (4.84/10 PC), Slate-throated Redstart (4.23/10 PC), Scintillant Hummingbird (*Selasphorus scintilla*) (1.60/10 PC), and White-throated Mountain-Gem (*Lampornis castaneiventris*) (1.31/10 PC) (Table 45). The two most abundant species at each station are highlighted in Table 45, 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 44.

Sulphur-winged Parakeet was the most abundant species in P, P/NR<30, and NR±30 and 2nd most abundant in OG (Table 46). Common Chlorospingus was the most abundant species in NR<30 and OG, and 2nd most abundant in P. Slate-throated Redstart was the most abundant species NR>30 and 2nd most abundant in P/NR<30, NR<30, and OG. Chestnut-capped Brush-Finch (*Arremon brunneinucha*) was the 2nd most abundant in NR>30 and NR±30. Northern Emerald-Toucanet shared 2nd most abundant with Slate-throated Redstart and Sulphur-winged Parakeet in OG.

TABLE 40: Raw Bird Abundance By Station – 2014

Station	Jan	Feb	Apr	May	Jun	Oct	Nov	Dec	Total
1*	1	22		17	3	2	2		47
2						1	1		2
3*		4		10	5	3	5		27
4	2					10	1		13
5*	3	6			1	6	12		28
6						0	1		1
7*		10		1	0		11		22
8		3		2	0		5		10
9*		3					0		3
10		10					1		11
11	1	13					1		15
12*	4	10				6			20
13		6			13	1			20
14*	6	27			6	0			39
15*	1	19			4	1			25
16*	4	6		10	0	4			24
17*	18	9		5	7	3	17		59
18*	11	4		6	0	7	9		37
19*	8	2			6	0	0		16
20*	19	14			2	14	14		63
22*	1	2				0	7		10
24*	11	5				1	15		32
25*	3	10		1		0	14		28
26*	7	7		21		0	4		39
27*	7	12		11	2	21			53
28*	12	15		20	10			3	60
29	0	7			0	0			7
30*	4	15				0		3	22
31*	15	2	1	8	3				29
32*	2	3		0	7				12
Total	140	246	1	112	69	80	120	6	774

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 41: Bird Abundance Per Point Count By Station – 2014

Station	Jan	Feb	Apr	May	Jun	Oct	Nov	Dec	Overall	# Point Counts
1*	1.0	7.3		8.5	3.0	2.0	1.0		4.7	10
2						1.0	0.5		0.7	3
3*		1.3		5.0	5.0	3.0	5.0		3.4	8
4	2.0					10.0	0.5		3.3	4
5*	3.0	3.0			1.0	6.0	6.0		4.0	7
6						0.0	0.3		0.3	4
7*		5.0		1.0	0.0		5.5		3.7	6
8		1.5		1.0	0.0		2.5		1.4	7
9*		1.5					0.0		1.0	3
10		5.0					1.0		3.7	3
11	1.0	6.5					1.0		3.8	4
12*	4.0	3.3				6.0			4.0	5
13		2.0			6.5	1.0			3.3	6
14*	6.0	9.0			3.0	0.0			5.6	7
15*	1.0	4.8			2.0	1.0			3.1	8
16*	4.0	2.0		5.0	0.0	4.0			2.7	9
17*	6.0	4.5		5.0	7.0	3.0	5.7		5.4	11
18*	3.7	2.0		6.0	0.0	7.0	3.0		3.4	11
19*	2.7	1.0			6.0	0.0	0.0		1.8	9
20*	6.3	7.0			2.0	14.0	4.7		6.3	10
22*	1.0	1.0				0.0	2.3		1.4	7
24*	5.5	2.5				1.0	3.8		3.6	9
25*	1.5	5.0		1.0		0.0	3.5		2.8	10
26*	3.5	3.5		7.0		0.0	1.0		3.3	12
27*	7.0	4.0		11.0	2.0	21.0			7.6	7
28*	12.0	5.0		20.0	10.0			3.0	8.6	7
29	0.0	2.3			0.0	0.0			1.2	6
30*	4.0	5.0				0.0		3.0	3.7	6
31*	7.5	1.0	1.0	4.0	3.0				3.6	8
32*	1.0	1.5		0.0	7.0				2.0	6
Overall	4.0	3.7	1.0	5.6	3.1	3.6	2.7	3.0	3.6	
# Point Counts	35	66	1	20	22	22	45	2		213

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 42: Bird Abundance By Habitat – 2014

Habitat	# Stations	Jan	Feb	Apr	May	Jun	Oct	Nov	Dec	Total
P	7	15	75		38	21	28	8	3	195
P/NR<30	4	36	24		16	2	35	24		141
NR<30	11	78	68	1	56	27	10	81	3	335
NR>30	1	6	27			6	0			40
NR±30	1	0	7			0	0			8
OG	6	5	45		2	13	7	7		85
Total	30	140	246	1	112	69	80	120	6	804

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.

TABLE 43: Bird Abundance per Point Count By Habitat – 2014

Habitat	# Stations	Jan	Feb	Apr	May	Jun	Oct	Nov	Dec	Overall	# Point Counts
P	7	2.5	4.2		6.3	3.5	4.7	1.6	3.0	4.1	48
P/NR<30	4	4.5	3.4		5.3	0.5	8.8	3.0		4.1	34
NR<30	11	4.6	3.2	1.0	6.2	4.5	1.3	3.0	3.0	3.7	90
NR>30	1	6.0	9.0			3.0	0.0			5.7	7
NR±30	1	0.0	2.3			0.0	0.0			1.3	6
OG	6	2.5	3.2		1.0	4.3	3.5	1.4		3.0	28
Overall	30	4.0	3.7	1.0	5.6	3.1	3.6	2.7	3.0	3.8	
# Point Counts		35	66	1	20	22	22	45	2		213

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.

TABLE 44: Raw Bird Species Abundance by Station – 2014

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
Cracidae														1					1		1	1						4			8
Black Guan														1					1		1	1						4			8
Odontophoridae					5		5																								10
Spotted Wood-Quail					5		5																								10
Cathartidae																							2								2
Black Vulture																							2								2
Accipitridae															1								2								3
Ornate Hawk-Eagle															1																1
Red-tailed Hawk																							2								2
Trochilidae	4	1	7		2	1				1	1	1	1	1	4	4	12	6	10	9	6		5	9	6	8		4	2	2	107
Fiery-throated Hummingbird																			1												1
Green Hermit	2																1			2			1								6
Green-crowned Brilliant																													1		1
Green-fronted Lancebill																													1		1
Lesser Violetear																1	1						3	2		3		1			11
Purple-throated Mountain-Gem		1	1																					1							3
Rivoli's Hummingbird ¹																												1		1	2
Rufous-tailed Hummingbird												1												1							2
Scintillant Hummingbird	1		6											1	4	3	2	3		1	4			1	5	3					34
Steely-vented Hummingbird																								1							1
Stripe-tailed Hummingbird					1	1											4			2	1			2							11
Violet Sabrewing												1					1				1		1		1						5
White-tailed Emerald																			1												1
White-throated Mountain-gem	1				1					1	1						3	3	8	4				1		2		2		1	28
Columbidae			1		2									2	2							7									14
Band-tailed Pigeon														1								7									8
Buff-fronted Quail-Dove														1																	1
Chiriqui Quail-Dove					2																										2
Ruddy Pigeon															2																2
White-tipped Dove			1																												1
Psittacidae	13			7			3			3			5	2	7	5	13	8		21						23	13	3		11	137
Sulphur-winged Parakeet	13			7			3			3			5	2	7	5	13	8		21						23	13	3		11	137
Cuculidae															1		3									2	1				7
Squirrel Cuckoo															1		3									2	1				7

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
Trogonidae											1		2		3	1										1	1		1		10
Collared Trogon											1		1		3	1										1	1		1		9
Trogonidae													1																		1
Resplendent Quetzal														1											1	1				1	4
Capitonidae														1											1	1				1	4
Red-headed Barbet					4		4	1			1	2	4	1				2		1					1	3	1				25
Ramphastidae					4		4	1			1	2	4	1				2		1					1	3	1				25
Northern Emerald-Toucanet							1					1																			2
Picidae							1					1																			2
Hairy Woodpecker					1			1		1		3					2	1												2	11
Furnariidae																	1														1
Plain Xenops								1		1								1													3
Ruddy Treerunner					1							2																			3
Spot-crowned Woodcreeper																														2	2
Spotted Woodcreeper												1																			1
Streak-breasted Treehunter																	1														1
Wedge-billed Woodcreeper	1		1	2						1	1		1	1	1	1	1	2	1	5		5		2	1	3		1	1		32
Tyrannidae				1																						2					3
Black Phoebe													1																		1
Dark Pewee			1																												1
Eastern Wood-Pewee																				5					1						6
Golden-bellied Flycatcher				1										1			1											1	1		5
Mountain Elaenia																										1					1
Ochraceous Pewee																1															1
Olive-striped Flycatcher																						4									4
Paltry Tyrannulet															1																1
Slaty-capped Flycatcher										1	1							1						1							4
Tufted Flycatcher																								1							1
Yellow-bellied Flycatcher	1																	1	1			1									4
Yellowish Flycatcher																						1									1
Tityridae																						1									1
Barred Becard														1																	1
Corvidae														1																	1
Brown Jay	1						2		1			1		2			1	1		1				1	6						17
Turdidae									1								1			1			1	5							9
Black-faced Solitaire							2							1																	3
Clay-colored Thrush											1		2		3	1											1	1		1	10

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
<i>Turdidae (cont'd)</i>																															
Mountain Thrush												1		1																	2
Ruddy-capped Nightingale-Thrush	1																														1
Slaty-backed Nightingale-thrush																								1							1
Sooty Thrush																		1													1
<i>Cinclidae</i>																							1								1
American Dipper																							1								1
<i>Troglodytidae</i>					1						1		1	2	1								2			1					9
Gray-breasted Wood-Wren											1			1	1								2								5
Wren sp.					1								1	1												1					4
<i>Vireonidae</i>		1	4																	1		1	1	1							9
Brown-capped Vireo		1	1																			1		1							4
Philadelphia Vireo																				1			1								2
Yellow-winged Vireo			3																												3
<i>Parulidae</i>	3		2	3	4		7	3	1	2	6	7	2	13	1	2	17	9	3	12	2	9	5	2	18	9		8	5	2	157
Black-and-white Warbler														1						1		1			2	1		1			7
Black-cheeked Warbler	1										3																				4
Black-throated Green Warbler							1																								1
Blackburnian Warbler					1							1													1	1					4
Collared Redstart					1			1		2	3							1		2	2	2						1			15
Costa Rican Warbler	1											1					2													2	6
Flame-throated Warbler							1					1																			2
Golden-crowned Warbler												1		1																	2
Golden-winged Warbler																						1									1
Kentucky Warbler														1																	1
Prothonotary Warbler				1												1										1					3
Slate-throated Redstart	1		1	1	2		5	2	1			3	2	8		1	13	7	3	7		4	4	2	8	4		6	5		90
Tennessee Warbler														2	1			1		1			1			1					7
Townsend's Warbler																	1														1
Tropical Parula																									6	1					7
Wilson's Warbler			1	1													1			1		1				1					6
<i>Thraupidae</i>	4		9	1	1					2		1		4		2	5	3	1			1	3	4		9					50
Bay-headed Tanager																	1					1				6					8
Blue Dacnis																										1					1
Blue-gray Tanager																1															1
Cherrie's Tanager										1							2														3
Scarlet-thighed Dacnis	2													1																	3

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Total
<i>Thraupidae (cont'd)</i>																															
Silver-throated Tanager														3		1	2	3	1				2	4		2					18
Slaty Flowerpiercer			5									1																			6
Yellow-faced Grassquit	2		4	1	1					1													1								10
<i>Emberizidae</i>	19		3		7			5	1	1	4	3	4	8	3	9	5	5		10	1	1	5	14	1	8	2	5	9	5	138
Chestnut-capped Brush-Finch	1							2			3			6		1		1		2			5				2	1			24
Common Chlorospingus	18		2		7			1	1	1	1	3	3	2	3	5	5	2		8	1			14	1	7		4	9	5	103
Sooty-capped Chlorospingus																						1									1
White-naped Brushfinch			1															1													2
Yellow-thighed Finch								2					1			3		1								1					8
<i>Cardinalidae</i>					1							1			1					3		6	1			1					14
Flame-colored Tanager															1					1						1					3
Hepatic Tanager												1																			1
Summer Tanager					1																										1
White-winged Tanager																				2		6	1								9
<i>Icteridae</i>																								1							1
Baltimore Oriole																								1							1
<i>Fringillidae</i>	2																									2					4
Elegant Euphonia	2																									2					4

1, Magnificent Hummingbird prior to August 2017 (CLO 2017a). *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 45: Bird Species Abundance Per 10 Point Counts by Station – 2014

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
# Point Counts	10	3	8	4	7	4	6	7	3	3	4	5	6	7	8	9	11	11	9	10	7	9	10	12	7	7	6	6	8	6	213
<i>Cracidae</i>														1.4					1.1		1.4	1.1						6.7			0.38
Black Guan														1.4					1.1		1.4	1.1						6.7			0.38
<i>Odontophoridae</i>					7.1		8.3																								0.47
Spotted Wood-Quail					7.1		8.3																								0.47
<i>Cathartidae</i>																							2.0								0.09
Black Vulture																							2.0								0.09
<i>Accipitridae</i>															1.3								2.0								0.14
Ornate Hawk-Eagle															1.3																0.05
Red-tailed Hawk																							2.0								0.09
<i>Trochilidae</i>	4.0	3.3	8.8		2.9	2.5				3.3	2.5	2.0	1.7	1.4	5.0	4.4	10.9	5.5	11.1	9.0	8.6		5.0	7.5	8.6	11.4		6.7	2.5	3.3	5.02
Fiery-throated Hummingbird																			1.1												0.05
Green Hermit	2.0																0.9			2.0			1.0								0.28
Green-crowned Brilliant																													1.3		0.05
Green-fronted Lancebill																													1.3		0.05
Lesser Violetear																1.1	0.9						3.0	1.7		4.3		1.7			0.52
Purple-throated Mountain-Gem		3.3	1.3																					0.8							0.14
Rivoli's Hummingbird¹																												1.7		1.7	0.09
Rufous-tailed Hummingbird													1.7											0.8							0.09
Scintillant Hummingbird	1.0		7.5											1.4	5.0	3.3	1.8	2.7		1.0	5.7			0.8	7.1	4.3					1.60
Steely-vented Hummingbird																								0.8							0.05
Stripe-tailed Hummingbird					1.4	2.5											3.6			2.0	1.4			1.7							0.52
Violet Sabrewing												2.0					0.9				1.4		1.0		1.4						0.23
White-tailed Emerald																			1.1												0.05
White-throated Mountain-gem	1.0				1.4					3.3	2.5						2.7	2.7	8.9	4.0				0.8		2.9		3.3		1.7	1.31
<i>Columbidae</i>			1.3		2.9									2.9	2.5								7.8								0.66
Band-tailed Pigeon														1.4									7.8								0.38
Buff-fronted Quail-Dove														1.4																	0.05
Chiriqui Quail-Dove					2.9																										0.09
Ruddy Pigeon															2.5																0.09
White-tipped Dove			1.3																												0.05
<i>Psittacidae</i>	13.0			17.5			5.0			10.0			8.3	2.9	8.8	5.6	11.8	7.3		21.0					32.9	18.6	5.0		13.8		6.43
Sulphur-winged Parakeet	13.0			17.5			5.0			10.0			8.3	2.9	8.8	5.6	11.8	7.3		21.0					32.9	18.6	5.0		13.8		6.43
<i>Cuculidae</i>															1.3		2.7								2.9	1.4					0.33
Squirrel Cuckoo															1.3		2.7								2.9	1.4					0.33



Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall	
Trogonidae											2.5		3.3		3.8	1.1										1.4	1.7			1.3		0.47
Collared Trogon											2.5		1.7		3.8	1.1										1.4	1.7			1.3		0.42
Resplendent Quetzal													1.7																			0.05
Capitonidae														1.4												1.4	1.4				1.7	0.19
Red-headed Barbet														1.4												1.4	1.4				1.7	0.19
Ramphastidae					5.7		6.7	1.4			2.5	4.0	6.7	1.4				1.8		1.0						1.4	4.3	1.7				1.17
Northern Emerald-Toucanet					5.7		6.7	1.4			2.5	4.0	6.7	1.4				1.8		1.0						1.4	4.3	1.7				1.17
Picidae							1.7					2.0																				0.09
Hairy Woodpecker							1.7					2.0																				0.09
Furnariidae					1.4			1.4		3.3		6.0					1.8	0.9													3.3	0.52
Plain Xenops																	0.9															0.05
Ruddy Treerunner								1.4		3.3								0.9														0.14
Spot-crowned Woodcreeper					1.4							4.0																				0.14
Spotted Woodcreeper																														3.3	0.09	
Streak-breasted Treehunter												2.0																				0.05
Wedge-billed Woodcreeper																	0.9															0.05
Tyrannidae	1.0		1.3	5.0						3.3	2.5		1.7	1.4	1.3	1.1	0.9	1.8	1.1	5.0		5.6		1.7	1.4	4.3		1.7	1.3		1.50	
Black Phoebe				2.5																							2.9					0.14
Dark Pewee													1.7																			0.05
Eastern Wood-Pewee			1.3																													0.05
Golden-bellied Flycatcher																				5.0						1.4						0.28
Mountain Elaenia				2.5										1.4			0.9												1.7	1.3		0.23
Ochraceous Pewee																											1.4					0.05
Olive-striped Flycatcher																1.1																0.05
Paltry Tyrannulet																						4.4										0.19
Slaty-capped Flycatcher															1.3																	0.05
Tufted Flycatcher										3.3	2.5							0.9							0.8							0.19
Yellow-bellied Flycatcher																		0.9						0.8								0.05
Yellowish Flycatcher	1.0																	0.9	1.1			1.1									0.19	
Tityridae																						1.1										0.05
Barred Becard																						1.1										0.05
Corvidae														1.4																		0.05
Brown Jay														1.4																		0.05
Turdidae	1.0						3.3		3.3			2.0		2.9			0.9	0.9		1.0				1.0	5.0							0.80
Black-faced Solitaire									3.3								0.9			1.0			1.0	4.2								0.42
Clay-colored Thrush							3.3							1.4																		0.14
Mountain Thrush												2.0		1.4																		0.09

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
<i>Turdidae (cont'd)</i>																															
Ruddy-capped Nightingale-Thrush	1.0																														0.05
Slaty-backed Nightingale-thrush																								0.8							0.05
Sooty Thrush																		0.9													0.05
<i>Cinclidae</i>																							1.0								0.05
American Dipper																							1.0								0.05
<i>Troglodytidae</i>					1.4						2.5		1.7	2.9	1.3								2.0			1.4					0.42
Gray-breasted Wood-Wren											2.5			1.4	1.3								2.0								0.23
Wren sp.					1.4								1.7	1.4												1.4					0.19
<i>Vireonidae</i>		3.3	5.0																	1.0		1.1	1.0	0.8							0.42
Brown-capped Vireo		3.3	1.3																			1.1		0.8							0.19
Philadelphia Vireo																				1.0			1.0								0.09
Yellow-winged Vireo			3.8																												0.14
<i>Parulidae</i>	3.0		2.5	7.5	5.7		11.7	4.3	3.3	6.7	15.0	14.0	3.3	18.6	1.3	2.2	15.5	8.2	3.3	12.0	2.9	10.0	5.0	1.7	25.7	12.9		13.3	6.3	3.3	7.37
Black-and-white Warbler														1.4						1.0		1.1			2.9	1.4		1.7			0.33
Black-checked Warbler	1.0										7.5																				0.19
Black-throated Green Warbler							1.7																								0.05
Blackburnian Warbler				1.4								2.0													1.4	1.4					0.19
Collared Redstart				1.4				1.4		6.7	7.5							0.9		2.0	2.9	2.2						1.7			0.70
Costa Rican Warbler	1.0											2.0					1.8													3.3	0.28
Flame-throated Warbler							1.7					2.0																			0.09
Golden-crowned Warbler												2.0		1.4																	0.09
Golden-winged Warbler																						1.1									0.05
Kentucky Warbler														1.4																	0.05
Prothonotary Warbler				2.5												1.1										1.4					0.14
Slate-throated Redstart	1.0		1.3	2.5	2.9		8.3	2.9	3.3			6.0	3.3	11.4		1.1	11.8	6.4	3.3	7.0		4.4	4.0	1.7	11.4	5.7		10.0	6.3		4.23
Tennessee Warbler														2.9	1.3			0.9		1.0			1.0			1.4					0.33
Townsend's Warbler																	0.9														0.05
Tropical Parula																										8.6	1.4				0.33
Wilson's Warbler			1.3	2.5													0.9			1.0		1.1				1.4					0.28
<i>Thraupidae</i>	4.0		11.3	2.5	1.4					6.7		2.0		5.7		2.2	4.5	2.7	1.1			1.1	3.0	3.3		12.9					2.35
Bay-headed Tanager																	0.9					1.1				8.6					0.38
Blue Dacnis																										1.4					0.05
Blue-gray Tanager																1.1															0.05
Cherrie's Tanager										3.3							1.8														0.14
Scarlet-thighed Dacnis	2.0													1.4																	0.14
Silver-throated Tanager														4.3		1.1	1.8	2.7	1.1				2.0	3.3		2.9					0.85

Station	1*	2	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	Overall
<i>Thraupidae (cont'd)</i>																															
Slaty Flowerpiercer			6.3									2.0																			0.28
Yellow-faced Grassquit	2.0		5.0	2.5	1.4					3.3													1.0								0.47
<i>Emberizidae</i>	19.0		3.8		10.0			7.1	3.3	3.3	10.0	6.0	6.7	11.4	3.8	10.0	4.5	4.5		10.0	1.4	1.1	5.0	11.7	1.4	11.4	3.3	8.3	11.3	8.3	6.48
Chestnut-capped Brush-Finch	1.0							2.9			7.5			8.6		1.1		0.9		2.0			5.0				3.3	1.7			1.13
Common Chlorospingus	18.0		2.5		10.0			1.4	3.3	3.3	2.5	6.0	5.0	2.9	3.8	5.6	4.5	1.8		8.0	1.4			11.7	1.4	10.0		6.7	11.3	8.3	4.84
Sooty-capped Chlorospingus																						1.1									0.05
White-naped Brushfinch			1.3															0.9													0.09
Yellow-thighed Finch								2.9					1.7			3.3		0.9								1.4					0.38
<i>Cardinalidae</i>					1.4							2.0			1.3					3.0		6.7	1.0			1.4					0.66
Flame-colored Tanager															1.3					1.0						1.4					0.14
Hepatic Tanager												2.0																			0.05
Summer Tanager					1.4																										0.05
White-winged Tanager																				2.0		6.7	1.0								0.42
<i>Icteridae</i>																								0.8							0.05
Baltimore Oriole																								0.8							0.05
<i>Fringillidae</i>	2.0																									2.9					0.19
Elegant Euphonia	2.0																									2.9					0.19
<i>Species Richness</i>	14	2	12	7	12	1	8	7	3	8	9	14	9	21	11	12	20	16	7	18	6	14	15	16	13	23	4	10	7	6	97

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.
1, Magnificent Hummingbird prior to August 2017 (CLO 2017a). *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 46: Bird Species Abundance Per 10 Point Counts by Habitat – 2014

Species	P	P/NR<30	NR<30	NR>30	NR>30>	OG	Overall
# Point Counts	55	38	101	8	7	34	213
Cracidae	0.7		0.3	1.3			0.38
Black Guan	0.7		0.3	1.3			0.38
Odontophoridae			1.0				0.47
Spotted Wood-Quail			1.0				0.47
Cathartidae			0.2				0.09
Black Vulture			0.2				0.09
Accipitridae	0.2		0.2				0.14
Ornate Hawk-Eagle	0.2						0.05
Red-tailed Hawk			0.2				0.09
Trochilidae	5.1	5.0	5.4	1.3		1.2	5.02
Fiery-throated Hummingbird			0.1				0.05
Green Hermit	0.4	0.5	0.2				0.28
Green-crowned Brilliant			0.1				0.05
Green-fronted Lancebill			0.1				0.05
Lesser Violetear	0.2	0.3	0.9				0.52
Purple-throated Mountain-Gem	0.4		0.1				0.14
Rivoli's Hummingbird ¹	0.4						0.09
Rufous-tailed Hummingbird			0.1			0.3	0.09
Scintillant Hummingbird	2.9	1.8	1.0	1.3			1.60
Steely-vented Hummingbird			0.1				0.05
Stripe-tailed Hummingbird		0.5	0.9				0.52
Violet Sabrewing	0.2		0.3			0.3	0.23
White-tailed Emerald			0.1				0.05
White-throated Mountain-gem	0.7	1.8	1.5			0.6	1.31
Columbidae	0.5		0.9	2.5			0.66
Band-tailed Pigeon			0.7	1.3			0.38
Buff-fronted Quail-Dove				1.3			0.05
Chiriqui Quail-Dove			0.2				0.09
Ruddy Pigeon	0.4						0.09
White-tipped Dove	0.2						0.05
Psittacidae	7.8	10.8	4.0	2.5	4.3	2.4	6.43
Sulphur-winged Parakeet	7.8	10.8	4.0	2.5	4.3	2.4	6.43
Cuculidae	0.5		0.4				0.33
Squirrel Cuckoo	0.5		0.4				0.33
Trogonidae	0.5	0.3	0.2		1.4	0.9	0.47
Collared Trogon	0.5	0.3	0.2		1.4	0.6	0.42
Resplendent Quetzal						0.3	0.05
Capitonidae	0.4		0.1	1.3			0.19
Red-headed Barbet	0.4		0.1	1.3			0.19
Ramphastidae	0.2	0.8	1.1	1.3	1.4	2.4	1.17
Northern Emerald-Toucanet	0.2	0.8	1.1	1.3	1.4	2.4	1.17
Picidae			0.1			0.3	0.09
Hairy Woodpecker			0.1			0.3	0.09
Furnariidae	0.4	0.3	0.3			1.5	0.52
Plain Xenops			0.1				0.05
Ruddy Treerunner		0.3				0.6	0.14
Spot-crowned Woodcreeper			0.1			0.6	0.14
Spotted Woodcreeper	0.4						0.09

Species	P	P/NR<30	NR<30	NR>30	NR>30>	OG	Overall
<i>Furnariidae (cont'd)</i>							
Streak-breasted Treehunter						0.3	0.05
Wedge-billed Woodcreeper			0.1				0.05
<i>Tyrannidae</i>	0.9	2.6	1.3	1.3		0.9	1.50
Black Phoebe		0.3	0.2				0.14
Dark Pewee						0.3	0.05
Eastern Wood-Pewee	0.2						0.05
Golden-bellied Flycatcher	0.2	1.3					0.28
Mountain Elaenia	0.2	0.3	0.2	1.3			0.23
Ochraceous Pewee			0.1				0.05
Olive-striped Flycatcher		0.3					0.05
Paltry Tyrannulet			0.4				0.19
Slaty-capped Flycatcher	0.2						0.05
Tufted Flycatcher		0.3	0.1			0.6	0.19
Yellow-bellied Flycatcher			0.1				0.05
Yellowish Flycatcher	0.2	0.3	0.2				0.19
<i>Tityridae</i>			0.1				0.05
Barred Becard			0.1				0.05
<i>Corvidae</i>				1.3			0.05
Brown Jay				1.3			0.05
<i>Turdidae</i>	0.2	0.5	1.0	2.5		0.6	0.80
Black-faced Solitaire		0.3	0.7			0.3	0.42
Clay-colored Thrush			0.2	1.3			0.14
Mountain Thrush				1.3		0.3	0.09
Ruddy-capped Nightingale-Thrush	0.2						0.05
Slaty-backed Nightingale-thrush			0.1				0.05
Sooty Thrush		0.3					0.05
<i>Cinclidae</i>			0.1				0.05
American Dipper			0.1				0.05
<i>Troglodytidae</i>	0.2		0.4	2.5		0.6	0.42
Gray-breasted Wood-Wren	0.2		0.2	1.3		0.3	0.23
Wren sp.			0.2	1.3		0.3	0.19
<i>Vireonidae</i>	0.9	0.3	0.3				0.42
Brown-capped Vireo	0.4		0.2				0.19
Philadelphia Vireo		0.3	0.1				0.09
Yellow-winged Vireo	0.5						0.14
<i>Parulidae</i>	6.2	6.8	6.2	16.3		6.2	7.37
Black-and-white Warbler	0.5	0.3	0.2	1.3			0.33
Black-cheeked Warbler	0.2					0.9	0.19
Black-throated Green Warbler			0.1				0.05
Blackburnian Warbler	0.2		0.2			0.3	0.19
Collared Redstart	0.2	0.8	0.5			1.8	0.70
Costa Rican Warbler	0.5		0.2			0.3	0.28
Flame-throated Warbler			0.1			0.3	0.09
Golden-crowned Warbler				1.3		0.3	0.09
Golden-winged Warbler			0.1				0.05
Kentucky Warbler				1.3			0.05
Prothonotary Warbler	0.2	0.5					0.14
Slate-throated Redstart	2.9	4.2	4.2	10.0		2.4	4.23
Tennessee Warbler	0.2	0.5	0.2	2.5			0.33
Townsend's Warbler			0.1				0.05
Tropical Parula	1.1		0.1				0.33

Species	P	P/NR<30	NR<30	NR>30	NR>30>	OG	Overall
<i>Parulidae (cont'd)</i>							
Wilson's Warbler	0.2	0.5	0.3				0.28
<i>Thraupidae</i>	2.4	1.6	2.4	5.0		0.9	2.35
Bay-headed Tanager			0.8				0.38
Blue Dacnis			0.1				0.05
Blue-gray Tanager		0.3					0.05
Cherrie's Tanager			0.2			0.3	0.14
Scarlet-thighed Dacnis	0.4			1.3			0.14
Silver-throated Tanager		1.1	1.1	3.8			0.85
Slaty Flowerpiercer	0.9					0.3	0.28
Yellow-faced Grassquit	1.1	0.3	0.2			0.3	0.47
<i>Emberizidae</i>	6.5	6.3	5.0	10.0	2.9	5.3	6.48
Chestnut-capped Brush-Finch	0.4	1.1	0.5	7.5	2.9	1.5	1.13
Common Chlorospingus	6.0	3.9	4.3	2.5		2.9	4.84
Sooty-capped Chlorospingus			0.1				0.05
White-naped Brushfinch	0.2	0.3					0.09
Yellow-thighed Finch		1.1	0.1			0.9	0.38
<i>Cardinalidae</i>	0.2	0.8	0.9			0.3	0.66
Flame-colored Tanager	0.2	0.3	0.1				0.14
Hepatic Tanager						0.3	0.05
Summer Tanager			0.1				0.05
White-winged Tanager		0.5	0.7				0.42
<i>Icteridae</i>			0.1				0.05
Baltimore Oriole			0.1				0.05
<i>Fringillidae</i>	0.4		0.2				0.19
Elegant Euphonia	0.4		0.2				0.19

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.

1, Magnificent Hummingbird prior to August 2017 (CLO 2017a).

4.3.3.2 THREATENED SPECIES ABUNDANCE

4.3.3.2.1 BLACK GUAN

Black Guan had an overall abundance of 0.38/10 PC and were found at Stations 14, 19, 22, 24 and 30 (Table 45). They were most abundant at Station 30 at 6.7/10 PC and 1.1 or 1.4/10 PC at the other stations. Black Guan were primarily found in NR>30 (1.3/10 PC), with lower abundances in P (0.7/10 PC) and NR<30 (0.3/10 PC) (Table 46).

4.3.3.2.2 GOLDEN-WINGED WARBLER

Golden-winged Warbler had an overall abundance of 0.05/10 PC (Table 45). A single female was identified on November 12, 2017 at Station 24 (NR<30 habitat).

4.3.3.2.3 ORNATE HAWK-EAGLE

Ornate Hawk-Eagle had an overall abundance of 0.04/10 PC (Table 45). A single, adult Ornate Hawk-Eagle was identified on October 29, 2014, at Station 15 (P habitat).

4.3.3.2.4 RESPLENDENT QUETZAL

Resplendent Quetzal had an overall abundance of 0.05/10 PC (Table 45). A single individual was seen on February 24, 2014, at Station 13 (OG habitat).

4.3.3.2.5 RUDDY PIGEON

Ruddy Pigeon had an overall abundance of 0.09/10 PC (Table 45). Two individuals were identified on February 19, 2014 at Station 15 (P habitat).

4.3.4 RICHNESS & DIVERSITY

Overall, 97 bird species of 26 families were identified during point count surveys with, in total, 0.46 species identified per point count (Table 47). The highest species richness was found at stations 28 (3.29 species/PC), 14 (3.00 species/PC), and 12 (2.80 species/PC). The lowest species richness was found at stations 6 (0.25 species/PC), 2 and 29 (0.67 species/PC), and 19 (0.78 species/PC). Looking at habitats, the highest species richness was found in NR>30 (2.63 species/PC), and the lowest in NR±30 (0.57 species/point count) (Table 48).

Overall, SID was 0.929 (Table 47). The highest SIDs were found at stations 2 and 9 (1.000), 12 (0.958), and 4 (0.939), while the lowest were found at stations 6 (single species), 4 (0.731), and 19 (0.742). Looking at habitats, the highest SID was found in OG (0.945) and the lowest in NR±30 (0.810) (Table 48). 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 47: Richness and Diversity By Station – 2014

Station	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
1*	10	8	14	1.40	0.783
2	3	2	2	0.67	1.000
3*	8	7	12	1.50	0.900
4	4	4	7	1.75	0.731
5*	7	10	12	1.71	0.889
6	4	1	1	0.25	N/A
7*	6	6	8	1.33	0.870
8	7	4	7	1.00	0.933
9*	3	3	3	1.00	1.000
10	3	7	8	2.67	0.927
11	4	7	9	2.25	0.914
12*	5	9	14	2.80	0.958
13	6	8	9	1.50	0.883
14*	7	13	21	3.00	0.930
15*	8	11	11	1.38	0.887
16*	9	7	12	1.33	0.906
17*	11	9	20	1.82	0.894
18*	11	9	16	1.45	0.910
19*	9	5	7	0.78	0.742
20*	10	9	18	1.80	0.857
22*	7	4	6	0.86	0.844
24*	9	9	14	1.56	0.901
25*	10	11	15	1.50	0.939
26*	12	8	16	1.33	0.852
27*	7	8	13	1.86	0.776
28*	7	13	23	3.29	0.922
29	6	4	4	0.67	0.810
30*	6	5	10	1.67	0.879
31*	8	6	7	0.88	0.751
32*	6	5	6	1.00	0.818
Overall	213	26	97	0.46	0.929

1, Simpson's Index of Diversity. *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 48: Richness and Diversity By Habitat – 2014

Habitat	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
P	55	19	44	0.80	0.901
P/NR<30	38	12	33	0.87	0.879
NR<30	101	25	69	0.68	0.941
NR>30	8	13	21	2.63	0.930
NR±30	7	4	4	0.57	0.810
OG	34	13	30	0.88	0.945
Overall	213	26	97	0.46	0.929

1, Simpson's Index of Diversity.

4.4 2013

4.4.1 SPECIES IDENTIFIED

Overall, 89 unique bird species were identified during point count surveys in 2013 (Table 49), all of which were identified visually and within the survey area, meaning they can be used for future analysis and comparison between sites.

4.4.1.1 THREATENED SPECIES

Three (3) species on the IUCN Redlist of Threatened Species (www.iucnredlist.org) were identified during the survey period (Table 49). Of these, the Ruddy Pigeon is considered Vulnerable (VU). The other two are considered Near Threatened (NT): Black Guan and Ornate Hawk-Eagle. One species, Streaked Xenops, has not been assessed by the IUCN.

TABLE 49: Bird Species Identified, All Methods – 2013

English Name	Scientific Name	IUCN Status ¹	IN Visual ²
Cracidae			
Black Guan	<i>Chamaepetes unicolor</i>	NT	x
Odontophoridae			
Spotted Wood-Quail	<i>Odontophorus guttatus</i>	LC	x
Accipitridae			
Ornate Hawk-Eagle	<i>Spizaetus ornatus</i>	NT	x
Swainson's Hawk	<i>Buteo swainsoni</i>	LC	x
Falconidae			
Bat Falcon	<i>Falco rufigularis</i>	LC	x
Trochilidae			
Bronzy Hermit	<i>Glaucis aeneus</i>	LC	x
Green Hermit	<i>Phaethornis guy</i>	LC	x
Lesser Violetear	<i>Colibri cyanotus</i>	LC	x
Purple-crowned Fairy	<i>Heliothryx barroti</i>	LC	x
Purple-throated Mountain-Gem	<i>Lampornis calolaemus</i>	LC	x
Scintillant Hummingbird	<i>Selasphorus scintilla</i>	LC	x
Snowy-bellied Hummingbird	<i>Amazilia edward</i>	LC	x
Stripe-tailed Hummingbird	<i>Eupherusa eximia</i>	LC	x
Violet Sabrewing	<i>Campylopterus hemileucurus</i>	LC	x
White-tailed Emerald	<i>Elvira chionura</i>	LC	x
White-throated Mountain-gem	<i>Lampornis castaneiventris</i>	LC	x
Columbidae			
Ruddy Pigeon	<i>Patagioenas subvinacea</i>	VU	x
Psittacidae			
Sulphur-winged Parakeet	<i>Pyrrhura hoffmanni</i>	LC	x
Cuculidae			
Squirrel Cuckoo	<i>Piaya cayana</i>	LC	x
Trogonidae			
Collared Trogon	<i>Trogon collaris</i>	LC	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
Picidae			
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	LC	x
Golden-olive Woodpecker	<i>Colaptes rubiginosus</i>	LC	x
Hairy Woodpecker	<i>Picoides villosus</i>	LC	x
Furnariidae			
Black-banded Woodcreeper	<i>Dendrocolaptes picumnus</i>	LC	x
Brown-billed Scythebill	<i>Campylorhamphus pusillus</i>	LC	x
Buff-fronted Foliage-gleaner	<i>Philydor rufum</i>	LC	x
Lineated Foliage-gleaner	<i>Syndactyla subalaris</i>	LC	x
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>	LC	x
Red-faced Spinetail	<i>Craniolaema erythrops</i>	LC	x
Ruddy Treerunner	<i>Margarornis rubiginosus</i>	LC	x
Spot-crowned Woodcreeper	<i>Lepidocolaptes affinis</i>	LC	x
Spotted Barbtail	<i>Premnoplex brunescens</i>	LC	x
Spotted Woodcreeper	<i>Xiphorhynchus erythropygius</i>	LC	x
Streaked Xenops	<i>Xenops rutilans</i>	NA	x

English Name	Scientific Name	IUCN Status ¹	IN Visual ²
Tyrannidae			
Black Phoebe	<i>Sayornis nigricans</i>	LC	x
Black-capped Flycatcher	<i>Empidonax atriceps</i>	LC	x
Boat-billed Flycatcher	<i>Megarhynchus pitangua</i>	LC	x
Bright-rumped Attila	<i>Attila spadiceus</i>	LC	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
Paltry Tyrannulet	<i>Zimmerius vilissimus</i>	LC	x
Slaty-capped Flycatcher	<i>Leptopogon superciliaris</i>	LC	x
Tufted Flycatcher	<i>Mitrephanes phaeocercus</i>	LC	x
Yellowish Flycatcher	<i>Empidonax flavescens</i>	LC	x
Tityridae			
Barred Becard	<i>Pachyrhamphus versicolor</i>	LC	x
Corvidae			
Brown Jay	<i>Psilorhynchus morio</i>	LC	x
Hirundinidae			
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	LC	x
Turdidae			
Black-faced Solitaire	<i>Myadestes melanops</i>	LC	x
Clay-colored Thrush	<i>Turdus grayi</i>	LC	x
Mountain Thrush	<i>Turdus plebejus</i>	LC	x
Orange-billed Nightingale-Thrush	<i>Catharus aurantiurostris</i>	LC	x
Ruddy-capped Nightingale-Thrush	<i>Catharus frantzii</i>	LC	x
Slaty-backed Nightingale-thrush	<i>Catharus fuscater</i>	LC	x
Troglodytidae			
Gray-breasted Wood-Wren	<i>Henicorbina leucophrys</i>	LC	x
Ochraceous Wren	<i>Troglodytes ochraceus</i>	LC	x
Vireonidae			
Brown-capped Vireo	<i>Vireo leucophrys</i>	LC	x
Lesser Greenlet	<i>Hylophilus decurtatus</i>	LC	x
Parulidae			
Black-and-white Warbler	<i>Mniotilta varia</i>	LC	x
Black-cheeked Warbler	<i>Basileuterus melanogenys</i>	LC	x
Black-throated Green Warbler	<i>Setophaga virens</i>	LC	x
Collared Redstart	<i>Myioborus torquatus</i>	LC	x
Costa Rican Warbler	<i>Basileuterus melanotis</i>	LC	x
Golden-crowned Warbler	<i>Basileuterus culicivorus</i>	LC	x
Slate-throated Redstart	<i>Myioborus miniatus</i>	LC	x
Tennessee Warbler	<i>Oreothlypis peregrina</i>	LC	x
Townsend's Warbler	<i>Setophaga townsendi</i>	LC	x
Tropical Parula	<i>Setophaga pitayumi</i>	LC	x
Wilson's Warbler	<i>Cardellina pusilla</i>	LC	x
Thraupidae			
Bay-headed Tanager	<i>Tangara gyrola</i>	LC	x
Cherrie's Tanager	<i>Ramphocelus costaricensis</i>	LC	x
Golden-hooded Tanager	<i>Tangara larvata</i>	LC	x
Scarlet-thighed Dacnis	<i>Dacnis venusta</i>	LC	x
Silver-throated Tanager	<i>Tangara icterocephala</i>	LC	x
Slaty Flowerpiercer	<i>Diglossa plumbea</i>	LC	x
Speckled Tanager	<i>Tangara guttata</i>	LC	x
Yellow-faced Grassquit	<i>Tiaris olivacea</i>	LC	x

English Name	Scientific Name	IUCN Status ¹	IN Visual ²
<i>Emberizidae</i>			
Chestnut-capped Brush-Finch	<i>Arremon brunneinucha</i>	LC	x
Common Chlorospingus	<i>Chlorospingus flavopectus</i>	LC	x
Rufous-collared Sparrow	<i>Zonotrichia capensis</i>	LC	x
Sooty-capped Chlorospingus	<i>Chlorospingus pileatus</i>	LC	x
White-naped Brushfinch	<i>Atlapetes albinucha</i>	LC	x
Yellow-thighed Finch	<i>Pselliophorus tibialis</i>	LC	x
<i>Cardinalidae</i>			
Flame-colored Tanager	<i>Piranga bidentata</i>	LC	x
Summer Tanager	<i>Piranga rubra</i>	LC	x
White-winged Tanager	<i>Piranga leucoptera</i>	LC	x

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.

4.4.3 ABUNDANCE

Point counts were only conducted in February, March, May, July, August, September, October, November and December and not all stations or habitat types were surveyed each month. The number of point counts were not evenly distributed across the stations and ranged from 1 to 11 in total.

Overall, 1109 birds were identified visually, inside the survey area during point counts in 2013 (Table 50) at an overall rate of 5.8/PC (Table 51). The stations with the highest overall abundance were 20 (10.6/PC), 1 (9.3/PC), and D (8.5/PC). The stations with the lowest abundance were 4 (1.0/PC), 6 and 10 (2.0/PC), and G (3.0/PC).

Overall, 1076 birds were identified at point counts where the habitat type was known (stations D, G, H and I have unknown habitat types) (Table 52). The habitat type with the highest overall abundance was P/NR<30 at 7.0/PC, the lowest abundance was found in OG at 4.8/PC (Table 53). Raw abundance by habitat type is shown in Table 52. The months with the highest overall abundance were August (7.7/PC) and September (7.6/PC), while the lowest were October (1.8/PC) and May (2.4/PC) (Tables 51 and 53).

Overall in 2013, New World Sparrows and Allies (*Emberizidae spp.*) was the most abundant family (10.00/10 PC), and New World Warblers (*Parulidae spp.*) was the second most abundant (7.55/10 PC) (Table 55). The most abundant families at each station are highlighted in Table 55, with the most abundant family in red text and the 2nd most abundant in blue text. New World Sparrows and Allies were the most abundant family in P, P/NR<30, NR<30, and NR±30, and 2nd most abundant in NR>30 (Table 56). New World Warblers were the most abundant family in NR>30 and OG, and 2nd most abundant in NR<30. True Parrots (*Psittacidae spp.*) were the 2nd most abundant family in P and P/NR<30. Wrens (*Troglodytidae spp.*) were the 2nd most abundant in NR±30 and Hummingbirds (*Trochilidae spp.*) were the 2nd most abundant in OG.

Overall, the five most abundant species in 2013 were: Common Chlorospingus (9.26/10 PC), Gray-breasted Wood-Wren (*Henicorbina leucophrys*) (6.37/10 PC), Slate-throated Redstart (5.84/10 PC), Sulphur-winged Parakeet (5.63/10 PC), and Silver-throated Tanager (2.42/10 PC) (Table 55). The two most abundant species at each station are highlighted in Table 55, 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 54.

Common Chlorospingus was the most abundant in P/NR<30, NR<30, and NR±30; and 2nd most abundant in P (Table 56). Gray-breasted Wood-Wren tied for most abundant in NR<30 with Common Chlorospingus, and was 2nd most abundant in NR±30. Slate-throated Redstart was most abundant in OG and NR>30 and 2nd most abundant in NR<30. Sulphur-winged Parakeet was most abundant in P and 2nd most abundant in P/NR<30 and tied for 2nd most abundant with Brown-capped Vireo (*Vireo leucophrys*) in NR>30. Northern Emerald-Toucanet was 2nd most abundant in OG. While Silver-throated Tanager was in the top 5 species for overall abundance, they were not in the top two of abundance in any of the habitats.

TABLE 50: Raw Bird Abundance By Station – 2013

Station	Jan	Feb	Mar	May	Jul	Aug	Sep	Oct	Nov	Dec	Total
1*		17		3	6	25			14		65
3*		10		1	2	21		1			35
4								1	1		2
5*		2	7	4	2	43		2			60
6									2		2
7*		3	2	0	0	19			2		26
8		3		2	3	20					28
9*									4		4
10									4		4
11		5		7					2		14
12*		12	14	5					2		33
13		5		0	9	15	13		4	5	51
14*		10	3	1	11	15	11		8	2	61
15*		4			8	17	12		14	1	56
16*		9	5	6	6	24	18		17	1	86
17*					6	33	6		3		48
18*		10	1	0	11	20	3	3	3		51
19*					2	14	8	2	6		32
20*		8			9	44	13		11		85
22*		1	2			20	10			1	34
24*		1	0			14	11		1	3	30
25*		12				17	6		2	3	40
26*		15				20	10		5	10	60
27*					2	15			1		18
28*					2	32			1		35
29					9	14					23
30*						31			12		43
31*						19	8		1		28
32*						15	7				22
D		11	6								17
G	3										3
H	6										6
I	7										7
Total	16	138	40	29	88	507	136	9	120	26	1109

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 51: Bird Abundance Per Point Count By Station – 2013

Station	Jan	Feb	Mar	May	Jul	Aug	Sep	Oct	Nov	Dec	Overall	# Point Counts
1*		17.0		3.0	6.0	8.3			14.0		9.3	7
3*		5.0		1.0	2.0	7.0		1.0			4.4	8
4								1.0	1.0		1.0	2
5*		2.0	7.0	4.0	2.0	14.3		2.0			7.5	8
6									2.0		2.0	1
7*		3.0	2.0	0.0	0.0	6.3			2.0		3.3	8
8		3.0		1.0	3.0	6.7					4.0	7
9*									4.0		4.0	1
10									2.0		2.0	2
11		5.0		7.0					1.0		3.5	4
12*		12.0	14.0	5.0					2.0		8.3	4
13		5.0		0.0	9.0	7.5	6.5		2.0	5.0	5.1	10
14*		10.0	3.0	1.0	11.0	7.5	5.5		4.0	2.0	5.5	11
15*		4.0			8.0	8.5	6.0		7.0	1.0	6.2	9
16*		9.0	5.0	6.0	6.0	12.0	9.0		8.5	1.0	7.8	11
17*					6.0	11.0	6.0		1.5		6.9	7
18*		10.0	1.0	0.0	11.0	6.7	3.0	3.0	1.5		4.6	11
19*					2.0	4.7	8.0	2.0	3.0		4.0	8
20*		8.0			9.0	14.7	13.0		5.5		10.6	8
22*		1.0	2.0			6.7	10.0			1.0	4.9	7
24*		1.0	0.0			4.7	11.0		1.0	3.0	3.8	8
25*		6.0				5.7	6.0		2.0	3.0	5.0	8
26*		7.5				6.7	10.0		5.0	10.0	7.5	8
27*					2.0	5.0			1.0		3.6	5
28*					2.0	10.7			1.0		7.0	5
29					9.0	4.7					5.8	4
30*						7.8			6.0		7.2	6
31*						6.3	8.0		1.0		5.6	5
32*						5.0	7.0				5.5	4
D		11.0	6.0								8.5	2
G	3.0										3.0	1
H	6.0										6.0	1
I	7.0										7.0	1
Overall	5.3	6.6	4.4	2.4	5.5	7.7	7.6	1.8	3.5	3.3	5.8	
# Point Counts	3	21	9	12	16	66	18	5	34	8		190

NOTE: Includes only birds identified visually during point counts inside the survey area. Prior to January 2016, all birds recorded during surveys were assumed to have been observed inside the survey area.

*, Stations that are part of the current sampling protocol (since March 2016).

TABLE 52: Bird Abundance By Habitat – 2013

Habitat	# Stations	Feb	Mar	May	Jul	Aug	Sep	Oct	Nov	Dec	Total
P	6	31		4	18	124	19	1	41	1	239
P/NR<30	4	27	6	6	26	88	34	4	32	1	224
NR<30	11	34	11	4	12	231	59	4	23	17	395
NR>30	1	10	3	1	11	15	11		8	2	61
NR±30	1				9	14					23
OG	6	25	14	14	12	35	13		16	5	134
Total	29	127	34	29	88	507	136	9	120	26	1076

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.

TABLE 53: Bird Abundance per Point Count By Habitat – 2013

Habitat	# Stations	Feb	Mar	May	Jul	Aug	Sep	Oct	Nov	Dec	Overall	# Point Counts
P	6	7.8		2.0	4.5	6.9	6.3	1.0	6.8	1.0	6.1	39
P/NR<30	4	9.0	3.0	3.0	8.7	11.0	8.5	2.0	4.6	1.0	7.0	32
NR<30	11	4.3	2.8	2.0	2.4	7.7	8.4	2.0	2.1	4.3	5.4	73
NR>30	1	10.0	3.0	1.0	11.0	7.5	5.5		4.0	2.0	5.5	11
NR±30	1				9.0	4.7					5.8	4
OG	6	6.3	14.0	2.8	6.0	7.0	6.5		2.0	5.0	4.8	28
Overall	29	6.4	4.3	2.4	5.5	7.7	7.6	1.8	3.5	3.3	6.4	
# Point Counts		20	8	12	16	66	18	5	34	8		187

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.

TABLE 54: Raw Bird Species Abundance by Station – 2013

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Total
Cracidae																				1							1							2
Black Guan																				1							1							2
Odontophoridae															2												2						1	5
Spotted Wood-Quail															2												2						1	5
Accipitridae												2	2									1												5
Ornate Hawk-Eagle												1	2																					3
Swainson's Hawk												1										1												2
Falconidae															1																			1
Bat Falcon															1																			1
Trochilidae	9	1		3			3	1	1			11	5	2	1	6	4	3	6	7	16	9	5	1	1	2	4	2	4	1		1	2	111
Bronzy Hermit																																1		1
Green Hermit				1				1				5										3	3	1			1							15
Lesser Violetear	5	1		1								2		1		1	1		1		2								1	1			1	18
Purple-crowned Fairy																											1	1						2
Purple-throated Mountain-Gem																					1	1						1						3
Scintillant Hummingbird	2												2	1		1	1			5	2								3					17
Snowy-bellied Hummingbird																					3	1												4
Stripe-tailed Hummingbird	1								1			1			1	3	1	2	2	2	2	4	2		1	1	2							26
Violet Sabrewing												2				1																		3
White-tailed Emerald																			1		5													6
White-throated Mountain-gem	1			1			3					1	3				1	1	2		1					1						1		16
Columbidae							1								5																			6
Ruddy Pigeon							1								5																			6
Psittacidae	24	10		16			2		1			2	6	10	20		10		4							1		1						107
Sulphur-winged Parakeet	24	10		16			2		1			2	6	10	20		10		4							1		1						107
Cuculidae															1															1				2
Squirrel Cuckoo															1															1				2
Trogonidae				2		1	1					4																	1					9
Collared Trogon				2		1	1					4																	1					9
Momotidae																		1																1
Lesson's Motmot																		1																1
Capitonidae				2		1							1						2								2							8
Red-headed Barbet				2		1							1						2								2							8
Ramphastidae				6	2	3				3	4	8	3	1				1				7				1								39
Northern Emerald-Toucanet				6	2	3				3	4	8	3	1				1				7				1								39

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Total	
Picidae	1	1		1		2	4			1	1		1						2							1								15	
Acorn Woodpecker							4																											4	
Golden-olive Woodpecker													1																					1	
Hairy Woodpecker	1	1		1		2				1	1								2							1								10	
Furnariidae				3		3				1	3		1		1				7			1	2		4	2	4	2						34	
Black-banded Woodcreeper										1																								1	
Brown-billed Scythebill						1																												1	
Buff-fronted Foliage-gleaner											1												1											2	
Lineated Foliage-gleaner						1					1																	1						3	
Olivaceous Woodcreeper																									1									1	
Red-faced Spinetail																			4						2	1	3							10	
Ruddy Treerunner																										1								1	
Spot-crowned Woodcreeper				2		1					1		1						3				1		1		1							11	
Spotted Barbtail																												1						1	
Spotted Woodcreeper				1																														1	
Streaked Xenops															1							1												2	
Tyrannidae	2	4	1				2				1	4	4	3	5	1	1	2	6	4	4	1	1	4	5	4		1						60	
Black Phoebe	1																																	1	
Black-capped Flycatcher		2																																2	
Boat-billed Flycatcher		1																						3										4	
Bright-rumped Attila															2	1																		3	
Dusky-capped Flycatcher													1	1																				2	
Golden-bellied Flycatcher			1														1	1	4			1			1			1						10	
Great Kiskadee											1	1																						2	
Paltry Tyrannulet							1					3	2												1	1	3							11	
Slaty-capped Flycatcher															1																			1	
Tufted Flycatcher	1						1							1	1				2	2	1					1							10		
Yellowish Flycatcher		1											1	1	1			1		2	3		1		3								14		
Tityridae	1															1	1		2	1														6	
Barred Becard	1															1	1		2	1														6	
Corvidae				1																						2		1							4
Brown Jay				1																					2		1							4	
Hirundinidae																			5															5	
Northern Rough-winged Swallow																			5															5	
Turdidae	1			9		3	2		1	1	3	4		2	1	1	1	1	1	1		1	1		1	1		4		2	1			43	
Black-faced Solitaire				7		1	2			1	3	2																		2				18	
Clay-colored Thrush														1																				1	

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Total	
<i>Turdidae (cont'd)</i>																																			
Mountain Thrush						2			1			1			1																1				6
Orange-billed Nightingale-Thrush																1																			1
Ruddy-capped Nightingale-Thrush	1																								1	1									3
Slaty-backed Nightingale-thrush				2								1		1			1	1	1	1		1	1						4						14
<i>Troglodytidae</i>	4	3		5		2	3					6	6	7	6	12	10	2	9	7	2	8	6	7	4	4	5		5						123
Gray-breasted Wood-Wren	4	3		5		2	3					6	5	7	6	12	10	2	8	7	2	8	6	7	4	4	5		5						121
Ochraceous Wren													1						1																2
<i>Vireonidae</i>				3		2	1				1	2	7	1	4	3		1	2	3			5		6	1			2		1				45
Brown-capped Vireo				3		2	1				1	2	6	1	4	3		1	2	3			5		5	1			2		1				43
Lesser Greenlet													1												1										2
<i>Parulidae</i>	1	5	1	1		6	5		1	5	14	7	13	5	10	11	2	11	12	4	2	3	9	5	7		12	7	4	10			1		174
Black-and-white Warbler													1			1						1								1					4
Black-cheeked Warbler																			1																1
Black-throated Green Warbler			1						1				1			1	1					1											1		7
Collared Redstart						3	1			1						1	1							1											8
Costa Rican Warbler							1								1	1			1				3					4		2					13
Golden-crowned Warbler											1		1		3															2					7
Slate-throated Redstart	1	3				2	1			4	8	7	10	5	4	5		11	7	4	2	1	6	4	5		11	3	4	3					111
Tennessee Warbler		1									1																								2
Townsend's Warbler											1														1										2
Tropical Parula				1			2								1	2			3						1		1								11
Wilson's Warbler		1				1					3				1															2					8
<i>Thraupidae</i>	4	9		3						2	2		1			4	6	3	7	2	2	7	5		1		1	3	2						64
Bay-headed Tanager																1																			2
Cherrie's Tanager																												1							1
Golden-hooded Tanager										1																									1
Scarlet-thighed Dacnis																									1										1
Silver-throated Tanager	2	1		3							2		1			2	6	3	6	2	2	7	5				1	2	1						46
Slaty Flowerpiercer	1	2																																	3
Speckled Tanager	1															1			1																3
Yellow-faced Grassquit		6								1																									7
<i>Emberizidae</i>	18	1		5		3	4	3		1	4	1	8	17	35	9	16	7	18	4	4	2	26		1	5	12	8	4	4	1	4	3		228
Chestnut-capped Brush-Finch													1	4	1					1			5						1					13	
Common Chlorospingus	15	1		3		1	3	2		1	4	1	5	10	28	9	13	7	13		3	2	17			5	12	6	4	3	1	4	3		176
Rufous-collared Sparrow																									1										1
Sooty-capped Chlorospingus				2				1																											3

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Total	
<i>Emberizidae (cont'd)</i>																																			
White-naped Brushfinch															2																				2
Yellow-thighed Finch	3					2	1						2	3	4		3		5	3	1		4					2						33	
<i>Cardinalidae</i>		1											3	2					2					1	2							1		12	
Flame-colored Tanager		1											1	1										1	1							1		6	
Summer Tanager														1																				1	
White-winged Tanager													2						2						1									5	

*, Stations that are part of the current sampling protocol (since March 2016).



TABLE 55: Bird Species Abundance Per 10 Point Counts by Station – 2013

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Over.
# Point Counts	7	8	2	8	1	8	7	1	2	4	4	10	11	9	11	7	11	8	8	7	8	8	8	5	5	4	6	5	4	2	1	1	1	190
Cracidae																				1.4							1.7							0.11
Black Guan																				1.4							1.7							0.11
Odontophoridae															1.8												3.3						10.0	0.26
Spotted Wood-Quail															1.8												3.3						10.0	0.26
Accipitridae												2.0	1.8									1.3												0.26
Ornate Hawk-Eagle												1.0	1.8																					0.16
Swainson's Hawk												1.0										1.3												0.11
Falconidae															0.9																			0.05
Bat Falcon															0.9																			0.05
Trochilidae	12.9	1.3		3.8			4.3	10.0	5.0			11.0	4.5	2.2	0.9	8.6	3.6	3.8	7.5	10.0	20.0	11.3	6.3	2.0	2.0	5.0	6.7	4.0	10.0	5.0		10.0	20.0	5.84
Bronzy Hermit																																10.0		0.05
Green Hermit				1.3				10.0				5.0										3.8	3.8	2.0			1.7							0.79
Lesser Violetear	7.1	1.3		1.3								2.0		1.1		1.4	0.9		1.3		2.5								2.5	5.0			10.0	0.95
Purple-crowned Fairy																											1.7	2.0						0.11
Purple-throated Mountain-Gem																					1.3	1.3						2.0					0.16	
Scintillant Hummingbird	2.9												1.8	1.1		1.4	0.9			7.1	2.5								7.5				0.89	
Snowy-bellied Hummingbird																						3.8	1.3											0.21
Stripe-tailed Hummingbird	1.4								5.0			1.0			0.9	4.3	0.9	2.5	2.5	2.9	2.5	5.0	2.5		2.0	2.5	3.3						1.37	
Violet Sabrewing												2.0				1.4																		0.16
White-tailed Emerald																			1.3		6.3												0.32	
White-throated Mountain-gem	1.4			1.3			4.3					1.0	2.7				0.9	1.3	2.5		1.3					2.5						10.0	0.84	
Columbidae							1.4							5.6																				0.32
Ruddy Pigeon							1.4							5.6																				0.32
Psittacidae	34.3	12.5		20.0			2.9		5.0			2.0	5.5	11.1	18.2		9.1		5.0						2.0		1.7							5.63
Sulphur-winged Parakeet	34.3	12.5		20.0			2.9		5.0			2.0	5.5	11.1	18.2		9.1		5.0						2.0		1.7							5.63
Cuculidae														1.1															2.5					0.11
Squirrel Cuckoo														1.1															2.5					0.11
Trogonidae				2.5		1.3	1.4					4.0																2.0						0.47
Collared Trogon				2.5		1.3	1.4					4.0																2.0						0.47
Momotidae																		1.3																0.05
Lesson's Motmot																			1.3															0.05
Capitonidae				2.5		1.3							0.9						2.5							5.0								0.42
Red-headed Barbet				2.5		1.3							0.9						2.5							5.0								0.42

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Over.	
<i>Ramphastidae</i>				7.5	20.0	3.8				7.5	10.0	8.0	2.7	1.1				1.3	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	2.05	
Northern Emerald-Toucanet				7.5	20.0	3.8				7.5	10.0	8.0	2.7	1.1				1.3				8.8				2.5								2.05	
<i>Picidae</i>	1.4	1.3		1.3		2.5	5.7			2.5	2.5		0.9						2.5							2.5								0.79	
Acorn Woodpecker							5.7																											0.21	
Golden-olive Woodpecker													0.9																					0.05	
Hairy Woodpecker	1.4	1.3		1.3		2.5				2.5	2.5								2.5							2.5								0.53	
<i>Furnariidae</i>				3.8		3.8				2.5	7.5		0.9		0.9				8.8			1.3	2.5		8.0	5.0	6.7	4.0						1.79	
Black-banded Woodcreeper										2.5																								0.05	
Brown-billed Scythebill						1.3																												0.05	
Buff-fronted Foliage-gleaner											2.5												1.3											0.11	
Lineated Foliage-gleaner						1.3					2.5																	2.0						0.16	
Olivaceous Woodcreeper																									2.0									0.05	
Red-faced Spinetail																			5.0						4.0	2.5	5.0							0.53	
Ruddy Treerunner																										2.5								0.05	
Spot-crowned Woodcreeper				2.5		1.3					2.5		0.9						3.8				1.3		2.0		1.7							0.58	
Spotted Barbtail																												2.0						0.05	
Spotted Woodcreeper				1.3																														0.05	
Streaked Xenops															0.9							1.3												0.11	
<i>Tyrannidae</i>	2.9	5.0	5.0				2.9				2.5	4.0	3.6	3.3	4.5	1.4	0.9	2.5	7.5	5.7	5.0	1.3	1.3	8.0	10.0	10.0		2.0						3.16	
Black Phoebe	1.4																																	0.05	
Black-capped Flycatcher		2.5																																0.11	
Boat-billed Flycatcher		1.3																						6.0										0.21	
Bright-rumped Attila															1.8	1.4																		0.16	
Dusky-capped Flycatcher													0.9	1.1																				0.11	
Golden-bellied Flycatcher			5.0														0.9	1.3	5.0			1.3			2.0			2.0						0.53	
Great Kiskadee											2.5	1.0																						0.11	
Paltry Tyrannulet							1.4					3.0	1.8												2.0	2.0	7.5							0.58	
Slaty-capped Flycatcher															0.9																			0.05	
Tufted Flycatcher	1.4						1.4							1.1	0.9				2.5	2.9	1.3					2.5								0.53	
Yellowish Flycatcher		1.3											0.9	1.1	0.9			1.3		2.9	3.8		1.3		6.0									0.74	
<i>Tityridae</i>	1.4															1.4	0.9		2.5	1.4														0.32	
Barred Becard	1.4															1.4	0.9		2.5	1.4														0.32	
<i>Corvidae</i>				1.3																						4.0		1.7							0.21
Brown Jay				1.3																						4.0		1.7							0.21
<i>Hirundinidae</i>																			6.3															0.26	
Northern Rough-winged Swallow																			6.3															0.26	

Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Over.		
<i>Turdidae</i>	1.4			11.3		3.8	2.9		5.0	2.5	7.5	4.0		2.2	0.9	1.4	0.9	1.3	1.3	1.4		1.3	1.3		2.0	2.5	30*	8.0	32*	10.0	10.0				2.26	
Black-faced Solitaire				8.8		1.3	2.9			2.5	7.5	2.0																		10.0					0.95	
Clay-colored Thrush														1.1																					0.05	
Mountain Thrush						2.5			5.0			1.0			0.9																10.0				0.32	
Orange-billed Nightingale-Thrush																1.4																			0.05	
Ruddy-capped Nightingale-Thrush	1.4																								2.0	2.5									0.16	
Slaty-backed Nightingale-thrush				2.5								1.0		1.1			0.9	1.3	1.3	1.4		1.3	1.3					8.0							0.74	
<i>Troglodytidae</i>	5.7	3.8		6.3		2.5	4.3					6.0	5.5	7.8	5.5	17.1	9.1	2.5	11.3	10.0	2.5	10.0	7.5	14.0	8.0	10.0	8.3		12.5						6.47	
Gray-breasted Wood-Wren	5.7	3.8		6.3		2.5	4.3					6.0	4.5	7.8	5.5	17.1	9.1	2.5	10.0	10.0	2.5	10.0	7.5	14.0	8.0	10.0	8.3		12.5						6.37	
Ochraceous Wren													0.9						1.3																0.11	
<i>Vireonidae</i>				3.8		2.5	1.4				2.5	2.0	6.4	1.1	3.6	4.3		1.3	2.5	4.3			6.3		12.0	2.5			5.0		10.0				2.37	
Brown-capped Vireo				3.8		2.5	1.4				2.5	2.0	5.5	1.1	3.6	4.3		1.3	2.5	4.3			6.3		10.0	2.5			5.0		10.0				2.26	
Lesser Greenlet													0.9												2.0										0.11	
<i>Parulidae</i>	1.4	6.3	5.0	1.3		7.5	7.1		5.0	12.5	35.0	7.0	11.8	5.6	9.1	15.7	1.8	13.8	15.0	5.7	2.5	3.8	11.3	10.0	14.0		20.0	14.0	10.0	50.0			10.0		9.16	
Black-and-white Warbler													0.9			1.4						1.3								5.0					0.21	
Black-checked Warbler																			1.3																0.05	
Black-throated Green Warbler			5.0						5.0				0.9			1.4	0.9					1.3											10.0		0.37	
Collared Redstart						3.8	1.4			2.5						1.4	0.9							2.0											0.42	
Costa Rican Warbler							1.4								0.9	1.4			1.3				3.8					8.0		10.0					0.68	
Golden-crowned Warbler											2.5		0.9		2.7															10.0					0.37	
Slate-throated Redstart	1.4	3.8				2.5	1.4			10.0	20.0	7.0	9.1	5.6	3.6	7.1		13.8	8.8	5.7	2.5	1.3	7.5	8.0	10.0		18.3	6.0	10.0	15.0					5.84	
Tennessee Warbler		1.3									2.5																								0.11	
Townsend's Warbler											2.5															2.0									0.11	
Tropical Parula				1.3			2.9								0.9	2.9			3.8						2.0		1.7								0.58	
Wilson's Warbler		1.3				1.3					7.5				0.9															10.0					0.42	
<i>Thraupidae</i>	5.7	11.3		3.8						5.0	5.0		0.9			5.7	5.5	3.8	8.8	2.9	2.5	8.8	6.3		2.0		1.7	6.0	5.0						3.37	
Bay-headed Tanager																1.4														2.5					0.11	
Cherrie's Tanager																												2.0								0.05
Golden-hooded Tanager										2.5																										0.05
Scarlet-thighed Dacnis																									2.0											0.05
Silver-throated Tanager	2.9	1.3		3.8							5.0		0.9			2.9	5.5	3.8	7.5	2.9	2.5	8.8	6.3				1.7	4.0	2.5						2.42	
Slaty Flowerpiercer	1.4	2.5																																		0.16
Speckled Tanager	1.4															1.4				1.3															0.16	
Yellow-faced Grassquit		7.5								2.5																										0.37
<i>Emberizidae</i>	25.7	1.3		6.3		3.8	5.7	30.0		2.5	10.0	1.0	7.3	18.9	31.8	12.9	14.5	8.8	22.5	5.7	5.0	2.5	32.5		2.0	12.5	20.0	16.0	10.0	20.0	10.0	40.0	30.0		12.00	
Chestnut-capped Brush-Finch													0.9	4.4	0.9					1.4			6.3							5.0					0.68	
Common Chlorospingus	21.4	1.3		3.8		1.3	4.3	20.0		2.5	10.0	1.0	4.5	11.1	25.5	12.9	11.8	8.8	16.3		3.8	2.5	21.3			12.5	20.0	12.0	10.0	15.0	10.0	40.0	30.0		9.26	



Station	1*	3*	4	5*	6	7*	8	9*	10	11	12*	13	14*	15*	16*	17*	18*	19*	20*	22*	24*	25*	26*	27*	28*	29	30*	31*	32*	D	G	H	I	Over.
<i>Emberizidae (cont'd)</i>																																		
Rufous-collared Sparrow																									2.0									0.05
Sooty-capped Chlorospingus				2.5				10.0																										0.16
White-naped Brushfinch															1.8																			0.11
Yellow-thighed Finch	4.3					2.5	1.4						1.8	3.3	3.6		2.7		6.3	4.3	1.3		5.0					4.0					1.74	
<i>Cardinalidae</i>		1.3											2.7	2.2					2.5					2.0	4.0							10.0		0.63
Flame-colored Tanager		1.3											0.9	1.1										2.0	2.0							10.0		0.32
Summer Tanager														1.1																				0.05
White-winged Tanager													1.8						2.5						2.0									0.26
<i>Species Richness</i>	17	15	2	19	1	16	16	3	4	9	15	19	25	19	21	19	14	12	26	13	14	15	14	7	20	13	14	13	9	9	3	3	5	89

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. *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 56: Bird Species Abundance Per 10 Point Counts by Habitat – 2013

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
# Point Counts	45	36	84	12	5	34	216
Cracidae	0.2		0.1				0.09
Black Guan	0.2		0.1				0.09
Odontophoridae	0.4	0.6					0.19
Spotted Wood-Quail	0.4	0.6					0.19
Accipitridae			0.1	1.7		0.6	0.23
Ornate Hawk-Eagle				1.7		0.3	0.14
Swainson's Hawk			0.1			0.3	0.09
Falconidae		0.3					0.05
Bat Falcon		0.3					0.05
Trochilidae	4.7	3.1	6.2	4.2	4.0	4.7	4.95
Green Hermit	0.4		0.8			1.8	0.69
Lesser Violetear	1.8	0.6	0.5			0.6	0.74
Purple-crowned Fairy	0.2		0.1				0.09
Purple-throated Mountain-Gem			0.4				0.14
Scintillant Hummingbird	1.3	0.3	1.0	1.7			0.79
Snowy-bellied Hummingbird			0.5				0.19
Stripe-tailed Hummingbird	0.7	1.1	1.9		2.0	0.6	1.20
Violet Sabrewing			0.1			0.6	0.14
White-tailed Emerald		0.3	0.6				0.28
White-throated Mountain-gem	0.2	0.8	0.4	2.5	2.0	1.2	0.69
Columbidae	1.1					0.3	0.28
Ruddy Pigeon	1.1					0.3	0.28
Psittacidae	10.0	9.4	2.0	5.0		1.5	4.95
Sulphur-winged Parakeet	10.0	9.4	2.0	5.0		1.5	4.95
Cuculidae	0.4						0.09
Squirrel Cuckoo	0.4						0.09
Trogonidae			0.5			1.5	0.42
Collared Trogon			0.5			1.5	0.42
Momotidae			0.1				0.05
Lesson's Motmot			0.1				0.05
Capitonidae		0.6	0.4	0.8	4.0		0.37
Red-headed Barbet		0.6	0.4	0.8	4.0		0.37
Ramphastidae	0.2		2.3	2.5	2.0	4.4	1.81
Northern Emerald-Toucanet	0.2		2.3	2.5	2.0	4.4	1.81
Picidae	0.4	0.6	0.4	0.8	2.0	1.8	0.69
Acorn Woodpecker						1.2	0.19
Golden-olive Woodpecker				0.8			0.05
Hairy Woodpecker	0.4	0.6	0.4		2.0	0.6	0.46
Furnariidae	0.9	2.2	1.8	0.8	4.0	1.2	1.57
Black-banded Woodcreeper						0.3	0.05
Brown-billed Scythebill			0.1				0.05
Buff-fronted Foliage-gleaner			0.1			0.3	0.09
Lineated Foliage-gleaner			0.2			0.3	0.14
Olivaceous Woodcreeper			0.1				0.05
Red-faced Spinetail	0.7	1.1	0.2		2.0		0.46
Ruddy Treerunner					2.0		0.05
Spot-crowned Woodcreeper	0.2	0.8	0.6	0.8		0.3	0.51
Spotted Barbtail			0.1				0.05
Spotted Woodcreeper			0.1				0.05
Streaked Xenops		0.3	0.1				0.09

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
<i>Tyrannidae</i>	2.9	3.6	2.3	3.3	8.0	2.1	2.78
Black Phoebe	0.2						0.05
Black-capped Flycatcher	0.4						0.09
Boat-billed Flycatcher	0.9						0.19
Bright-rumped Attila		0.6	0.1				0.14
Dusky-capped Flycatcher	0.2			0.8			0.09
Golden-bellied Flycatcher		1.7	0.5				0.46
Great Kiskadee						0.6	0.09
Paltry Tyrannulet	0.2		0.1	1.7	6.0	1.2	0.51
Slaty-capped Flycatcher		0.3					0.05
Tufted Flycatcher	0.4	0.8	0.4		2.0	0.3	0.46
Yellowish Flycatcher	0.4	0.3	1.2	0.8			0.65
<i>Tityridae</i>	0.2	0.8	0.2				0.28
Barred Becard	0.2	0.8	0.2				0.28
<i>Corvidae</i>	0.2		0.4				0.19
Brown Jay	0.2		0.4				0.19
<i>Hirundinidae</i>		1.4					0.23
Northern Rough-winged Swallow		1.4					0.23
<i>Turdidae</i>	0.7	0.8	2.6		2.0	3.2	1.85
Black-faced Solitaire			1.0			2.4	0.74
Clay-colored Thrush	0.2						0.05
Mountain Thrush		0.3	0.2			0.6	0.23
Orange-billed Nightingale-Thrush			0.1				0.05
Ruddy-capped Nightingale-Thrush	0.2		0.1		2.0		0.14
Slaty-backed Nightingale-thrush	0.2	0.6	1.2			0.3	0.65
<i>Troglodytidae</i>	6.9	6.9	5.7	5.0	8.0	2.6	5.69
Gray-breasted Wood-Wren	6.9	6.7	5.7	4.2	8.0	2.6	5.60
Ochraceous Wren		0.3		0.8			0.09
<i>Vireonidae</i>	0.7	1.7	2.7	5.8	2.0	1.2	2.04
Brown-capped Vireo	0.7	1.7	2.6	5.0	2.0	1.2	1.94
Lesser Greenlet			0.1	0.8			0.09
<i>Parulidae</i>	7.1	6.9	7.3	10.8		9.4	7.55
Black-and-white Warbler			0.2	0.8			0.14
Black-cheeked Warbler		0.3					0.05
Black-throated Green Warbler		0.6	0.2	0.8		0.3	0.28
Collared Redstart	0.2	0.3	0.5			0.6	0.37
Costa Rican Warbler		0.6	1.0			0.3	0.51
Golden-crowned Warbler		0.8		0.8		0.3	0.23
Slate-throated Redstart	6.2	3.1	4.6	8.3		5.9	5.00
Tennessee Warbler	0.2					0.3	0.09
Townsend's Warbler			0.1			0.3	0.09
Tropical Parula	0.2	1.1	0.5			0.6	0.51
Wilson's Warbler	0.2	0.3	0.1			0.9	0.28
<i>Thraupidae</i>	3.6	3.6	3.6	0.8		1.2	2.96
Bay-headed Tanager	0.2		0.1				0.09
Cherrie's Tanager			0.1				0.05
Golden-hooded Tanager						0.3	0.05
Scarlet-thighed Dacnis			0.1				0.05
Silver-throated Tanager	1.1	3.3	3.1	0.8		0.6	2.13
Slaty Flowerpiercer	0.7						0.14
Speckled Tanager	0.2	0.3	0.1				0.14
Yellow-faced Grassquit	1.3					0.3	0.32

Habitat	P	P/NR<30	NR<30	NR>30	NR±30	OG	Total
Emberizidae	11.6	19.2	8.2	6.7	10.0	3.8	10.00
Chestnut-capped Brush-Finch	0.9	0.3	0.7	0.8			0.56
Common Chlorospingus	9.3	15.0	5.7	4.2	10.0	3.2	7.64
Rufous-collared Sparrow			0.1				0.05
Sooty-capped Chlorospingus			0.2			0.3	0.14
White-naped Brushfinch		0.6					0.09
Yellow-thighed Finch	1.3	3.3	1.4	1.7		0.3	1.53
Cardinalidae	0.9	0.6	0.2	2.5			0.51
Flame-colored Tanager	0.7		0.1	0.8			0.23
Summer Tanager	0.2						0.05
White-winged Tanager		0.6	0.1	1.7			0.23

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.

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.

4.4.3.1 THREATENED SPECIES ABUNDANCE

4.4.3.1.1 BLACK GUAN

Black Guan had an overall abundance of 0.11/10 PC and were found at Stations 22 and 30 (Table 55). They were most abundant at Station 30 at 1.7/10 PC (P) and 1.4/10 PC at Station 22 (NR<30).

4.4.3.1.2 ORNATE HAWK-EAGLE

Ornate Hawk-Eagle had an overall abundance of 0.16/10 PC (Table 55) and were found at Stations 13 and 14. They were most abundant at Station 14 at 1.8/10 PC (NR>30) and 1.0/10 PC at Station 13 (OG).

4.4.3.1.3 RUDDY PIGEON

Ruddy Pigeon had an overall abundance of 0.32/10 PC (Table 55) and were found at Stations 8 and 15. They were most abundant at Station 15 at 5.6/10 PC (P) and 1.4/10 PC at Station 8 (OG).

4.5.1 RICHNESS & DIVERSITY

Overall, 89 bird species of 24 families were identified during point count surveys with, in total, 0.47 species identified per point count (Table 57). The highest species richness was found at stations I (5.00 species/PC), D (4.50 species/PC), and 28 (4.00 species/PC). The lowest species richness was found at stations 4 and 6 (1.00 species/PC), 18 (1.27 species/PC), and 27 (1.40 species/PC). Looking at habitats, the highest species richness was found in NR±30 (2.60 species/PC), and the lowest in NR<30 (0.74 species/PC) (Table 58).

Overall, SID was 0.935 (Table 57). The highest SIDs were found at stations G, 4, and 10 (1.000); 7 (0.963), and 8 (0.952), while the lowest were found at stations 6 (0.000), H (0.600), and 27 (0.804). Looking at habitats, the highest SID was found in NR±30 (0.946) and the lowest in OG (0.898) (Table 58). 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 57: Richness and Diversity By Station – 2013

Station	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
1*	7	9	17	2.43	0.807
3*	8	8	15	1.88	0.886
4	2	2	2	1.00	1.000
5*	8	13	19	2.38	0.898
6	1	1	1	1.00	0.000
7*	8	9	16	2.00	0.963
8	7	10	16	2.29	0.952
9*	1	2	3	3.00	0.833
10	2	4	4	2.00	1.000
11	4	7	9	2.25	0.901
12*	4	9	15	3.75	0.911
13	10	10	19	1.90	0.931
14*	11	13	25	2.27	0.942
15*	9	11	19	2.11	0.909
16*	11	10	21	1.91	0.834
17*	7	8	19	2.71	0.894
18*	11	8	14	1.27	0.854
19*	8	9	12	1.50	0.837
20*	8	14	26	3.25	0.946
22*	7	9	13	1.86	0.916
24*	8	5	14	1.75	0.943
25*	8	9	15	1.88	0.897
26*	8	8	14	1.75	0.882
27*	5	4	7	1.40	0.804
28*	5	11	20	4.00	0.948
29*	4	9	13	3.25	0.921
30*	6	9	14	2.33	0.849
31*	5	8	13	2.60	0.915
32*	4	6	9	2.25	0.887
D	2	4	9	4.50	0.926
G	1	3	3	3.00	1.000
H	1	3	3	3.00	0.600
I	1	4	5	5.00	0.857
Overall	190	24	89	0.47	0.935

1, Simpson's Index of Diversity. *, Stations that are part of the current sampling protocol (since March 2016).

TABLE 58: Richness and Diversity By Habitat – 2013

Habitat	# Point Counts	Family Richness	Species Richness	Species Richness/ Point Count	SID ¹
P	45	19	44	0.98	0.901
P/NR<30	36	17	40	1.11	0.944
NR<30	84	20	62	0.74	0.942
NR>30	12	14	25	2.08	0.921
NR±30	5	10	13	2.60	0.946
OG	34	15	40	1.18	0.898
Overall	216	25	88	0.41	0.936

1, Simpson's Index of Diversity.

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