GUIDE

TO

MULTIPLE POINT FIXED TRANSECTS IN PARROT MONITORING

A method for rapidly estimating the minimum number of distinct individual parrots and relative density

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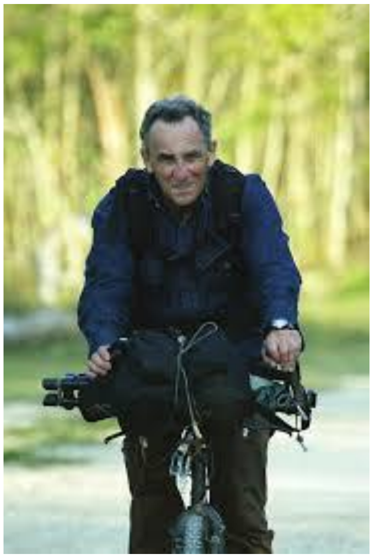
Dedication

I would not have embarked on so many years of counting parrots, and teaching others to do so without Jim Wiley. His immense patience with us in Guatemala during the early 1990's helped us understand the parrots there, and the foundations of parrot conservation. This guide is for him.



Summary

Most populations of parrots in Mesoamerica and South America occur in patches fragmented by habitat degradation and wildlife extraction patterns. Determining the density of a parrot species in one location might not correlate with the density in other patches, challenging conservationists to use this data to form concrete conservation plans, especially given limited financial and time resources. As an alternative, fixed transects adapted for parrot foraging, nesting, and roosting behavior provides a rapid assessment of the minimum number of distinct individuals along a multiple point transect. Transects are uniquely designed to fit the terrain, reported locations and behavior of parrots. They also yield patterns and locations of roosting, nesting, and foraging, all necessary to decipher where the parrots are and how they might be protected. With this information communities and resources can be targeted to quickly address further wildlife trade and environmental degradation issues. Repeating these rapid assessments yields more precise relative density data of various parrot species and allows for analyzing population trends over time and throughout the year. We have used this technique throughout Latin America as a first step in identifying "hot spots" where birds still occur, where it is possible to support communities and businesses, and where we can concentrate our efforts. Biologists need to be aware of parrot ecology and behavior to conduct accurate counts, but after initial training, also become proficient in removing possible duplicate birds from the counts and incorporating community members in the effort. This counting technique then becomes a method for raising consciousness and awareness, focusing people on parrot biology and behavior and hence increasing their appreciation of the species, and providing workers, students, and community members with a concrete and satisfying method for contributing to their future.

The Use of this Guide

Under the Common Creative copyright, you are free to reproduce this guide without making any adjustments, as long as you cite the author and One Earth Conservation. You can elect to use only a portion of a page or an entire page, or section, again just as long as you cite One Earth as your source. Currently the volume is in English, but if you are able to work with us, we would be delighted to translate it to Spanish and to French, and also to other indigenous and local languages. In the meantime, please contact us if you'd like to access PowerPoint presentations in Spanish. We can also answer questions by email and if you would like with an in-person workshop, especially as methodology must be adapted to species, terrain, and socioeconomic realities. To date we have taught this technique to children, youth, university students, government agencies, indigenous villages, nonprofit conservation organizations, community members and leaders, and other parrot conservationists.

This guide will be published in versions, as we imagine we will make edits and additions based on comments from readers, and as we gather more data. You can help contribute to future editions of this guide by sending us your comments at info@oneearthconservation.org. Check regularly on our website to see if we have a new edition, and if you leave us your email, we will contact you when future publications are released. We plan on producing two addendums to this guide: an in-depth study of the yellow-naped amazon on Ometepe Island, Nicaragua that shows how to use this methodology extensively givens its possible disadvantages and inconsistencies, and a methodology for using moving river transects in forested areas.

We have purposively left out more exact data and maps in a variety of area due to the heavy pressure of poaching and the illegal wildlife trade in the area. We don't want to make it any easier for the traders than it already is. If you'd like more specific information, please do not hesitate to contact us.

In the meantime, please use this guide to help you in any way possible - the parrots of the world need you to count them because they are counting on us to understand, cherish, and adapt human behavior and initiatives to keep them flying free.

Introduction

History and Use

When I first began parrot conservation in-situ during the late 1980's in Guatemala, our project had an alliance with Jim Wiley of the USFWS. His expertise was with parrots of the Caribbean, especially Puerto Rico where there were frighteningly few parrots left. We had no idea how many parrots we had in our project area of Southern Guatemala, or where they were, how they nested, what they ate, where they slept, and what might be the limiting factors of reproduction. In short, Jim had to basically teach us everything, including the idea of fixed transects. A fixed transect is using 2 or more points counted at the same time at a certain distance from each other to reduce the number of parrots counted more than once and to maximize the area covered. I have not been able to find any written literature about Jim's version of the technology, and it is not in their book, "The Parrots of Luquillo Forest: Natural History and Conservation of the Puerto Rican Parrot" (1). I recall that he said it was something that they stumbled upon as useful, adapting it from other parrot counting techniques (2). Jim died in 2018, and so he is not here to tell us more, nor for me to thank him for his tremendous contribution to our conservation efforts in assisting a multitude of parrot conservationists and parrots in the Americas. To date we have used this technique with the yellow-naped amazon in Southern Guatemala, the yellow-headed amazon in Belize, Guatemala, and Honduras, the yellow-naped amazon in Honduras in two different locations, Chismuyo Bay de and Guanaja Island, the yellow-naped amazon on Ometepe Island, Nicaragua, the sun parakeet in the Rapanui, Guyana, the 22 species of parrots in the Rupununi, Guyana, and the 27 species of parrots in Suriname. Basically wherever One Earth Conservation works, and if it fits with the experience and needs of the local communities and organizations, we begin our conservation work with this rapid assessment.

Why This Rapid Assessment Technique?

We need a rapid assessment that gives us a quick glance of what is happening with the parrots because they are a very endangered group of birds with over 50% of the population declining, and nearly one third categorized at some level of threat by the IUCN (3,4). With over 33 years of experience in front-line parrot conservation efforts in the Americas, I feel that the parrots don't have the time for repeated surveys which would increase precision. With only 100 individuals of a given species left in some countries, we need to act immediately because we know the major threats to the population – the capture of the adults, chicks, and eggs for the wildlife trade (both domestic and international), which is illegal in all but two countries in the Americas, Guyana and Suriname, and habitat loss (5, 6). Human harm to biodiversity and human communities is extensive and persistent in the Americas, contributing to the case that parrots are in an emergency situation. With poaching of nests reaching 100% in many areas, we need a method to rapidly assess where there are birds and enact conservation steps based on quickly obtained results. Collecting more data and more precision can come with future addition of time and resources, but intravitally, resources need to be dedicated to saving the birds once we know where they are, and roughly how many exist. Conservation projects typically don't have financial depth to carry out statistically robust data sets even if the parrots had the time for humans to collect and analyze the data.

Information Gathered

The possible understanding of parrots in a given area and specific information gathered by this technique is diverse and highly applicable to parrot conservation efforts (Table 1).

More about the Minimum Number of Distinct Individuals (MNDI)

The MNDI can be obtained during just one evening or morning count. Given that methodology is strictly adhered to for all counts, multiple sites can be rapidly covered and compared. By aggressively throwing out any possible duplicate birds (birds accidentally counted twice by the same person at one location or between people at different locations on the same occasion) we can with full confidence say that this is the minimum number of distinct individuals. It is always accurate for the date and time of the count. There might be more, but there will not be less. This number then guides us in locating or repeating future counts, and for beginning conservation measures. In the section, *Examples*, there will be a greater description of how the MNDI might help you in your given area or project.

Table 1. General Information and Specific Information
Minimum Number of Distinct Individuals (MNDI)
Estimation of number of different species and their relative density
Exact or approximate locations of roost sites
Indication of group sizes and percentages of chicks, juveniles, and adults
Exact or approximate locations of nest sites
Species of food eaten and foraging behavior and locations
Species of nest trees and nesting behavior
Flight patterns and locations of different flocks (that may or may not mix with each other)
Location for future counts and repeatable counts for greater precision
Sites of future conservation efforts (depending on the number and species of parrots, and the use and owner of the terrain)
Human individuals capable of and interested in future conservation efforts

Methodology

Equipment

One of the advantages of this technique is that it doesn't take a lot of resources as some population methods do to complete. For this reason, we suggest beginning with a minimum equipment list (Table 2). More expensive and additional equipment can be added as resources allow (Table 3). Perhaps the greatest cost is in transportation to the sites, and if necessary, stipends to support the counters. Usually in a new area, counters are willing to volunteer or partially volunteer their time so as to learn and teach the technique, and to learn about their parrots. Possible additional costs such as transportation and stipends are listed here (Table 4).

One can substitute a cell phone for keeping time if counters already have cell phones and watches cannot be purchased. Cell phones have disadvantages compared to wrist watches in that they run out of batteries, can take longer to read the time, break easier, and tie up one hand that is otherwise needed for using the binoculars and recording data. Advantages of cell phones is that they display the correct time, and might already be purchased and can give the longitude and latitude of each point without needing to buy a dedicated hand held GPS device and a compass. Regardless of whether a GPS, cell phone, or watch of some kind is used, it is critical that each person be able to record an accurate time that is synchronized precisely with all other time pieces of other counters. It is up to the leader of the count to insure that their watch or cell phone displays an accurate time.

Costs can be reduced with the leader being the only one recording the longitude and latitude of each point as she places the counters in their appointed position. She can also be the only one with a compass, but making sure to point out the directions (North, South, East, West) to each counter before the count begins. There will be less confusion, however, if each counter has their own compass.

Table 2. Basic Equipment for Each Point
Watch
Binoculars
Pen
Data Sheets
Light sources (headlamp, flashlight, or phone)
Hard surface to write on data sheets
Color guide of parrot species

Table 3. Additional Equipment for the Leader of Each Point
Compass
GPS
Calculator (on phone)
Spotting scope
Map of area
Camera
Range finder
Audio recordings of parrot calls
Summarizing Data Form
Computer to analyze and report results

Table 4. Additional Resources
Classroom training for theory, identification, and methodology
Field training
Field transportation and fuel
Field notebooks for each person
Backpack and rain gear for each person
Snacks, meals, stipends
Interviews with local people to determine location of the birds
Local people joining the count
Good management and people skills of leaders
Time allotted for data summary, community and relationship building, and celebration

Before You Begin Actual Counting

Training

We have conducted training in several locations without any classroom instruction. We simply have multiple practice sessions during actual counts until each person is capable of conducting a count by themselves. A classroom training, however, has several advantages: you can train many people together, it reduces the number of actual training sessions in the field, builds confidence and group cohesion more rapidly, advances the need for and methods of parrot conservation, and issues greater consistency in technique amongst all participants. In a classroom, recordings of parrot calls can be more easily shared and learned.

Regardless of whether class room time is allotted, training in the field with all participants at one point is critical. To begin with, a count is conducted with a capable counter as the leader, demonstrating parrot identification and how to fill out the form. Participants have plenty of time to ask questions and learn by observation in a relatively low stress situation. During the following count, all participants are still at a single point, but are paired up, or in groups of 3-4, preferably with one experienced counter in each group. Each group fills out one form. By the third count the pairs or small groups can manage a point on their own, and any advice, guidance, or corrections can be accomplished during the post-count review.

Identification

Identifying parrots can be challenging, especially given the often low-light and long distances between observer and parrot. For this reason, we encourage people to not be shy about identifying parrots as “unknown amazon” “unknown parakeet,” or “unknown macaw,” for example. We count all species of parrots in an area so as to maximize data collection, to obtain numbers of species present and relative density, and because we don’t know which species might be in low numbers unless we count them. In some regions of Central America where only 5 different species exist, and with clear size and voice differences, identifying all parrots present doesn’t take much training. But in forested areas where visualization of birds is challenging or where there are many species of parrots, it takes practice to be able to identify parrots. In cases where parrot identification is particularly challenging, or where there are many species or individuals, we suggest that counters emphasize the targeted, suspected, endangered species. For instance, I might say, “only count sun parakeets as we don’t want to be distracted with other species when we are here primarily for a sun parakeet survey.” I have found, however, that most people can proficiently and rapidly identify many different species of parrots with accuracy with just a little practice. If there is any doubt however, they report “unknown species” and as time goes by the number of unknowns decreases. For instance, on Ometepe Island non-vocalizing red-lored and yellow-naped amazons from a distance in low light are difficult to distinguish until one learns to recognize their different flight patterns. Because of this, the first year of parrot surveys had more “unknown amazons” compared to later years when the two species were more readily distinguished from each other.

Placement of Points

Before we begin counting, we also have to know where to count. We really don’t want to count where parrots are never seen, although I keep reminding our teams that a “zero” is a solid data point, boring to be sure, but important to our understanding of where parrots are, or aren’t. Valuable time and resources can be conserved if counting teams can confer with locals as to where they see birds flying, feeding, nesting and roosting. Once we have identified an area, the question becomes how many points and where to place them. Admittedly this is an art, and we can’t always get it right on the first attempt. We may find, for instance, that most of the birds are just barely out of hearing and visual range, and are flying away from us instead of towards us. In this case, we adjust the placement of the points to maximize territory covered and birds observed. Generally, as a guide we want to use as many points as qualified people and resources we have, for the more people we have, the greater territory covered. Also, as a very general guide, we want to place people where we reduce the observation overlap, but also where we don’t lose too many birds between points that can’t be seen or heard. Basically, we can hear parrots, perhaps if loud, up to 500 meters or more, and if we have a clear line of sight, can see the larger parrots also at around 500 meters (admittedly less on both accounts for myself). This means placing people about every 1000 meters, double the distance people can see and hear. However, the terrain might not allow for good sites for counting parrots every 1000 meters due to vegetation growth, hills, mountains, rivers, loud traffic, waterfalls, etc. The perfect counting site is one that is elevated and has an uninterrupted 360 degree view. We might not want to place people in a line but staggered so as to get an idea of how parrots are flying and where a roost site might be. For instance, in some areas, we might place people in a circle to surround a forest patch into which parrots fly (Figure 1), or a straight line with outlying points that are higher to see more birds or to see if they are flying much further or to other transect lines (Figure 2).. We have placed points in the middle of towns (though the sound from a bar's music can make this a less than optimal site for observation by sound), easily walking to the middle of farmer fields, scrambling to the top of rocks on volcanic slopes, dipping one's feet in pools and jacuzzis at ecolodges, reliving past glories on soccer fields (a common and open space in many areas), swaying in the wind while perched atop of water towers, sun bathing on lakeside docks, or sitting on tree trunks and fence posts.

In heavily forested areas there are not open places to see birds, so the amount of species observed could be much less than it actually is. For this reason, we seek waterways where we can perch on the banks to see up and downriver, and a bit across to the other bank. We also look for sandbanks and rocks in the middle of the river, or use a boat with an anchor to keep us in the middle of the river where there is the greatest visibility.

Finally, we want to place points where it is safe to do so and where there is time and resources to get people to and from points.

Timing

We use a strict guideline for when counts are conducted, however they can be either morning or evening counts, both of which cover the time when the activity of parrots is the greatest (more "bang for the buck" to count the most numbers of parrots in the shortest amount of time.) Regardless it is important to compare only evening counts to evening counts, especially in a given region, as certain species move differently at night than in the morning. Often if we have the time, we count twice per transect as we can get very different numbers between morning and evening counts. Also, it is time consuming to move between points with finishing up later in the evening at one location, and then having to get to the next location in time for an early morning count as terrain must be studied, locals interviewed, and points fixed before the count can begin. When rapidly moving through an area we finish up the morning count, summarize the data from the night before and the morning count, do any education or awareness activities with the community members pack up, move to the next location, look for and confirm points, do the evening count, and then crash solidly into our beds, hammocks, or tents and repeating the count in the morning count at the same place as the night before.

Each count lasts two hours, exactly. This helps reduce the likelihood of counting duplicates as birds generally move in one direction in the evening. There is more back and forth movement in the morning, especially with the smaller species that can be more locally situated and don't move far for foraging (we will address the issue of duplicates later in this Guide). Also, two hours generally captures the most active time of most parrot activity: 30 minutes before sunrise and 90 minutes after in the morning, and 90 minutes before and 30 minutes after sunset. In some areas, 30 minutes before sunrise is almost dark with some stars still shining, but in others it is much lighter. The same phenomenon goes for the evening as well. Parrots, especially those coming and going from roost sites, move when there is little light, and that's why we start and end so early and late respectively. If we started any later in the morning we would miss the major movement of parrots out of the area, and if we end too early, we don't catch all the birds coming into roost.

Often we will place our counters earlier because we have found that in some areas the parrots begin to move in greater frequency earlier than 90 minutes before sunset. For instance, sun parakeets forage earlier, moving mostly unidirectionally through foraging areas to their roost areas. We then come with two numbers - the MNDI during the two-hour count and the MNDI for the entire period. More than having a second MNDI, placing counters earlier can help us locate nests, foraging areas, and flight patterns. More often than not, there is little activity during theses earlier times, and even during the first part of regular 2 hour count.

Though we are strict about this protocol so we can compare sites and regions, we do need to keep aware of any possible danger or risk to the counters. In one location in Honduras, the local counters were concerned about poisonous snakes on the trail, so they left their count sites early so they wouldn't be walking in the dark. Also if there is a security risk, or the terrain or water ways are difficult to navigate in the dark, we make allowances in the timing of the counts. It may not be possible to count in some areas because of the length of time getting to and from count sites. That is why we camp where possible as close to the counting points as possible, though making camps requires more time and resources to support the people.

Data Collected

A host of data is collected (Table 5 and Figure 3). The name of the transect refers to where the transect is being conducted, such as the name of a river, ranch, or community. There may be multiple transects in each area, but a specific name is given to each transect that consists of several points counted at the same time. For instance, we might have "Upper Ireng River," "Lower Ireng River," "Randy's Farm Lower Ireng River," etc. The name of the point refers to the one GPS coordinate that is exactly where the counter is located. Often numbers are used (#1, #2, #3, #4, etc) or a description of the area (Road End, North Point, Soccer field, Ceiba tree on slope), or both. All GPS points should use the same format, such as degrees, decimal, or UTM. The date is written out in long hand (January 24, 2020) because abbreviated numbers can be confusing as some countries interchange the slot for date and time. For instance, in the USA the date for March 5 would be 3/5/2020 but in other countries it would be 5/3/2020, causing confusion whether it is a day in March or May. The page number refers to the order of pages and the total number of pages, as counts often have more than one page of data collected. For instance, if there were 3 pages of data, the first page is 1/3, the second page is 2/3, and the final page is 3/3. The weather is a rough description at the beginning of the count. Temperature is listed as cold, cool, warm, hot, very hot. Wind is recorded as zero, slight, moderate, high. Cloud cover is estimated as a percentage of the total sky, such as 75% means that 75% of the sky is covered with clouds. If there is any precipitation during the count, it's length and amount is recorded here as well as below.

Table 5. Data Collected During Count
Name of Transect (General location)
Name or number of point (Exact location)
GPS Coordinates
Date
Page number
Weather
For Each Parrot Sighting: Time Species Size of group Direction of flight Altitude Distance from the counter Vocalizations Comments Letter corresponding to the location and flight on back of form

Before the count, all time pieces are set to the exact same time. This is important so duplicate birds can be accounted for between points. Time is entered in a 24 hour format (0 – 2400). In the next column the species is recorded. We suggest using an abbreviation which is quicker to write down during the rush of counting (such as SUP for sun parakeet, OWA for orange winged amazon). In the summary section at the bottom of the page we spell out the name to insure no confusion. The following column is the number of birds seen. This might be trickiest part of the entire data sheet, and attention is given to insure that all counters record the data in the same fashion. If only one bird parrot is seen, this is a "1." If two birds are flying obviously as a pair, as many parrots do (wing to wing) this is a "2." If three birds are flying more or less wing to wing, this is a "3." If the three birds consist of a clear pair and then another bird, often this year's chick, somewhat separated but within 50 meters, it is written as "(2+1)" and later it can be determined if this is a trio and is likely a family group, or not. If three birds are not flying wing to wing, but are clearly of the same group, and within 50 meters of each other it is recorded as “(1+1+1). The same system is used for birds of 4, 5, 6 and more birds together. For instance a group of 5 birds might pass by as a pair and then a group of 3 (likely fledglings” and this is recorded as “(2+3). The parenthesis indicates that the group is flying together more or less. For larger flocks, we try our best to determine how they are flying, though the birds in larger groups or the smaller birds may not fly in clear set formations. For instance, a group of 29 birds that fly over might be recorded as “(29)” if they are all as a group, such as with white-eyed parakeets coming low into a roost site, or might be written as “(2+2+2+4+3+3+2+2+2+5+2)” such as orange-winged amazons flying high coming into a roost site. The reason for this nomenclature will become clear during the section on data merging and tabulation.

If the birds are flying further apart than 50 meters, and yet are flying at the same time in the same direction, they are recorded with a separation of a comma, such as 2,2,2,3,2. Sometimes birds are far away, flying too quickly, or are too many at one time to get an accurate count. In cases such as these, the flock size must be estimated, being as conservative as possible. So, if a high flying group of green parakeets comes swirling into a roost site 300 meters away and no camera is available to take a picture where the individuals can later be accurately counted, the counter is instructed to only write the number of individuals that they could distinguish, and not over estimate. Such a sighting is recorded as “(12+)” signifying that it is a flock of at least 12 individuals and probably more. The same system is used for birds that are only heard – the number means the clear number of distinct voices heard, such as a flock of painted parakeets that fly low in over the trees and are barely glimpsed, but heard. Maybe only 3 voices were heard at one time, and this flock is listed as 3+ but could in fact be as many as 10 birds because not all of them were chattering at the same time, or could not be heard at the distance. It is important in the methodology to be as conservative as possible, and always if you have to, err on the side of underestimation as compared to overestimation.

The direction that the birds are flying is then estimated. We encourage the listing of at least 8 directions (N, NE, E, SE, S, SW, W, NW). The directions are determined in relation to where the counter is located. There is usually not enough time to write down exact compass headings and such details might not be of use. So, a bird flying from South to North, would be written as S→N or just →North because it is assumed that the bird came from the south. Sometimes the birds don’t fly in a straight line and the flight might be recorded as SW→N meaning that they started to the SW of the counter bur curved slightly and ended up going North. Sometimes birds change directions a couple of times and a flight might be listed as N→S→E. This is because the bird is heading south, but veers off to land in a group of trees to roost or forage. The drawing on the back of the page usually is able to capture these kinds of details.

Altitude that the bird is flying is in relation to the vegetation that the bird is flying over. This takes practice and a leader using a range finder can help everyone improve their ability to estimate. We record this because altitude often suggests how far a bird is flying, such as a yellow-naped flying right at tree height of 25 meters if probably going to land soon versus one flying at 100 meters who is flying over bodies of water and has come from a distance and is going a distance. Note that parrots can descend quickly so even a bird flying at 100 meters might quickly down to a roosting or foraging area, but generally, a high altitude means the birds are doing distance flying. Recording the altitude also helps us eliminate duplicate birds observed between points as birds seen at the same time flying in the same direction are not the same birds if one is at 20 meters and the other at 100 meters.

Often there is a lack of consistency in how counters record altitude because it is difficult to practice. In cases such as this, the altitude can be recorded as heights such as “below canopy,” (below average tree height) canopy” (which is right above the trees or within 10 meters), “above canopy” (10-30 meters higher than the trees), high (40 meters plus higher than the trees), and very high (100 meters or more above the trees and almost not visible to the counter). Sometimes birds are going over ridges and valleys and at some times their flight is “above canopy” and other times when cruising over a valley they are “high” or “very high” or “extremely high.” In cases such as these we record the lowest altitude, such as when the bird is crossing over a mountain top only a few meters above the trees. The drawing on the back of the page will also make this clearer, or alternatively, the counter could record (canopy to very high, or if in meters, 25-80 meters).

Distance is the distance in meters when the birds are at their closest to the counter. This, like altitude, takes practice with the use of a range finder to improve accuracy. This even more than altitude is important for removing double counted birds between points. The vocalization column is either a Y for yes (or S for Si) or a N for No. If the bird is only heard and not seen we record this as “only.” Birds that are heard but not seen are tabulated as part of the count, being careful that these same birds do not later visually appear. Within this column if there is time, the kind of vocalization can also be recorded (fledgling begging for food, bugling, alarm calls, etc). The letter column refers to the drawing on the back as each flight is given a letter (or a number) to distinguish it from all other flight directions. If many birds are flying in the same direction, the letter can be used multiple times. The comment section is where we record whether the birds are juveniles, of specific identity such as male, female, old, injured, and if particular behavior is observed, such as eating certain fruits, copulating, playing, etc.). A completed form contains a great deal of data, yet can be quickly filled in during the count (Figure 4).

The drawing on the back can be as detailed as needed to convey the relative position, distance, and flight of the parrots from the observer. The most important marks are to fill out the compass directions and the location of the counter. Landmarks can be added to help understand the movement of birds, with some counters approaching artistry in the depictions, and others not so much. (Figures 5 and 6). An arrow is drawn with a corresponding letter for each flight of birds, with some counts showing so much bird movement that the map resembles a pot of spaghetti (Figure 7).

Table 6. Advantages of Fixed Transects
A large area can be surveyed rapidly because more than one point is employed
Relatively low resource use because you only need 1-2 counts per area
Data can be rapidly assimilated to use to design initial conservation plans and to raise awareness of possible stakeholders
Local community members or visitors can easily be incorporated into the count as extra pairs of eyes, increasing awareness and possible commitment
The methodology requires an understanding of parrot behavior and by learning to focus on parrots, counters not only learn about the parrots, but suddenly become more aware of them as active agents in their world, increasing curiosity, connection, and commitment to preserving them
It is a relatively easy tool that local community members can use, producing data and requiring team work, hence raising commitment and social capital within the community and conservation stakeholders.

Merging and Tabulating the Data After the Count

Before each counter can summarize their birds, they must consult with the other counters so as to remove duplicate birds between points. To do so, after each count the counters gather around a table with a summary sheet placed in the center showing a larger map with the location of all the points. The counters arrange themselves in order of how their points are arranged on the larger map. Then the leader begins with just one species and the earliest time, and counters share what times they saw birds and where they flew, so the other points can put an “x” near their birds if the birds were seen first by another counter. While going through this procedure, each point leader must also mark in the comment section if their own birds were duplicates of each other. For instance, if one counter saw a pair of yellow-headed amazons flying to the north, and 45 minutes later a pair comes from the north flying south, they are recorded on the data sheet with the word “duplicate” in the comment section. They are not added to the final summary. This process can take a long time, going bird by bird, especially with novice counters and many counters, and after years of experience I suggest that it should not be attempted in the dark or on an empty stomach. This is a critical part of the methodology and so we are careful in insuring that we know what each parrot is doing and if they have already been counted or not. If there is any doubt, we don't add the bird into the summary.

After each species has been reviewed, each point leader then adds their total number of birds into the summary section, including the numbers of single, 2,3,4,5,6 and groups of birds, insuring that the numbers add up. Above the summary section, final comments are written for each point, such as "probable roost site to the North," "suspicious nesting activity at tree #2," and "34 birds slept in one roost site, and 12 birds shared with the transect completed the day before."

The leader then collects each data sheet and fills out the summary sheet (figure 8) for that transect

The Issue of Duplicates

The question always arises, how do we know that we aren't counting the birds twice? I gave a sermon once (being a Unitarian Universalist minister) where I mentioned that we had counted 2111 orange-winged amazon parrots at a roost site in Guyana and when the people lined up to shake my hand after the service, they didn't comment so much about the topic of sermon, but instead asked, "how did you count so many birds with any accuracy?" or "how do you know they were distinct individuals?" Of course we can never be sure, and that is where practice and closer observation comes into play. It also helps that many species of parrots have decipherable behavior and flight patterns, such that for evening counts they are usually all headed to a roost site and are flying in the same direction. In the mornings, parrots head out to foraging areas, again in a set direction, and often, at least with the bigger parrots, don't return within the two-hour limit. Also, within each point, counters keep an eye on birds that stay in the area and keep a running track of how many birds went "over there to the North" so they know to mark as duplicates any birds that come from that direction.

The greater challenge comes when we start tabulating birds of different transects, such as wanting to know how many birds are in a given area or on an island, which means that there might be many 4-point transects. How can we be sure one afternoon in one transect we are counting birds that the day before weren't counted in another transect? There are several ways to reduce the likelihood that duplicate birds aren't counted between transects. First, we know our species of birds and realize that many birds follow the same flight patterns from day to day, as the fruiting trees and roost sites don't change radically from one day to the next. Second, we count multiple transects in the same period of time (on consecutive days) reducing the chance that birds are moving from one transect to another. We also keep track of how many birds leave the transect area and head to other transect areas, and in the final summary of the entire region, we don't count any birds that come and go to different transects. We can also place extra counters between transects to see if birds move between transects, but often birds don't move between transects because they are placed far enough apart so that birds don't mix between transects. For instance, on Ometepe Island, after years of counting and placing outside counters between transects, we found it rare that birds crossed over from one transect into another on a given night. It seemed that each roosting area of yellow-naped amazons didn't include birds from other roosting areas.

But what about sharing birds on different nights? We do know that parrots can change their roost sites and flight patterns, especially if weather is involved, and perhaps based on some clues that humans cannot decipher. The only way to be absolutely sure then is to count multiple transects in the same night. It is a logistical challenge to place this many experienced counters over a large area, and then later to tabulate the data. We did just that on Ometepe Island, counting our 4 major roost sites (with 4 points each) all together over 3 different days, so we could see if birds moved between transects or varied their densities at each roost site (see following chapter on Ometepe Island for a detailed analysis.) We didn't find much mixing between roost sites, but we did see that the numbers at each roost site sometimes changed from evening to evening. We weren't sure where the birds went but they didn't seem to be shifting to the other roosting areas.

To be clear, the purpose of this methodology isn't precision, but to only get a conservative estimate of birds in the area sufficient for conservation purposes. For further discussion on how to adapt this technique for particular uses, with an understanding of its advantages and disadvantages, please refer to that later section, and the Ometepe chapter.

Data Analysis

The easiest, and perhaps most important number is the MNDI (Minimum Number of Distinct Individuals) for each point, each transect, and each group of transects in a region. The MNDI is immediately available, and if greater precision is required, counts can be repeated and the methodology adapted concurrently with other conservation measures. The MNDI will tell us roughly where parrots are and aren't and where to concentrate activities. The MNDI can also be used to inform communities, landowners, organizations, and governmental agencies about the rough status of their parrots, so it is a tool for education and awareness.

Fairly quickly we can also calculate the relative density of the parrot species in a given area. This helps us see the distribution of parrot species which can be an indicator of stress on the population, such as poaching and trapping for the wildlife trade. For instance, we may find no macaws in a given area and a very low percentage of parrots known for their ability to talk and relative ease to have as a pet, such as a yellow-headed or yellow-naped parrot. Normally there would be many of these species to mix in with the other parrots, but their absences suggest past and probably ongoing hunting pressure. In some parts of South America we only find orange-winged amazons of the larger parrots, a species not highly prized in the pet trade because they don't talk as well and are noisier and more excitable. In other regions we may find only parakeets because first they take the macaws, then the parrots that mimic well, and then the parakeets. Habitat destruction restricting food and available nesting areas might also impact the relative density, but without further more detailed studies, it is difficult to pinpoint the exact cause. However, with both the MNDI and the Relative Density we can begin to inform people and help organize and empower them for local and regional parrot conservation.

Further information that is valuable is a preliminary understanding of the demographic distribution of a given population. Generally, we assume that groups of 3, 4, 5 and even 6 are family groups (parents with this year's fledglings) or groups of juveniles. We can then calculate the percentage of first year birds in the general population. This helps us see the replacement generation of young birds, and if few family or juvenile flocks are seen, then we are suspicious that there are limiting factors to reproduction, most likely poaching. If fixed transects are used for this purpose, they need to be conducted within a few months after fledging season, which can vary from region to region even with the same species. So, to get an accurate estimate of the parentage of first-year birds, we need more data as to when birds fledged, where family groups migrate to as they might move out of the area leaving only nonbreeding adults behind, and ideally repeat the count for greater precision. Roughly speaking, even a few counts in an area quickly reveal that health status of populations for if only pairs are seen, then it is a dire sign.

Discussion of Parrot Population Techniques

There are many different ways to monitor the status of parrot populations, and statistical manipulations (6-11), all of which can be coupled with the use of Fixed Transects. All of them have advantages and disadvantages, and some of them can increase precision with repetition. Even still, the margin of error in accuracy is large given the variability of bird movements and counter consistency. Each counter is able to see and hear differently, and having more than one counter at a site can increase the number and accuracy of birds observed.

Advantages

Specific advantages for Fixed Transects are many, (Table 6) given that they aren't oriented towards consistency, but more for a rapid assessment upon which further counting and monitoring methods, and conservation practices can build.

Disadvantages

Some possible disadvantages or unknowns also exist, including the lack of consistency and precision that is shared with other counts. Birds aren't always visible and audible, and counters might miss birds and misidentify them. However, the strict protocol for removing possible duplicate birds based on parrot behavior might decrease the likelihood to overestimate the birds in an area compared to other methods. Its' lack of consistency is more likely to underestimate parrots than overestimate. Counters need to invest some time in learning to identify parrot flights and vocalizations, and large differences in counts can result between those with better hearing and vision and those without. To get the best information from these counts, you need to count where parrots are, and hence must obtain local knowledge or have experience on estimating where parrots are by reading a satellite image pinpointing likely terrain, and also by reviewing observations that show where others have seen birds.

If this technique is used to get an estimate of a larger area containing more than one transect, there is a chance that birds between one day and the next could move between transects, meaning that you count the birds twice on successive days. Every species, habitat type, parrot culture, and season could mean that a lot of birds move daily between transects or that very few do. To minimize possible error of duplicate birds between transects you can remove birds that move outside of the transect area headed to or coming from another transect and also use transects that clearly are far enough apart that parrots will not fly between transects. This takes knowledge and experience of the birds to make inferences about inter-transect movement (see examples and Chapter on Ometepe).

Example of Uses

South Coast of Guatemala – Yellow-naped Amazon

I had worked in Guatemala during the 1980's and 1990s when yellow-naped amazons were heard and seen every day throughout the Pacific Coast. A study on limitations of reproductive factors yielded a more than 95% poaching rate of nests, accompanied by loss of habitat as the cattle ranches were converted to the monoculture of sugar cane (the primary forests were long gone and there were little secondary forest patches available). The project collapsed, with much dismay on my part, and nearly 15 years later I returned to the area to see what was going on with the parrots. The roost site previously with slightly more than 250 distinct individuals had been converted with sugar cane, though we pleaded with the owners to leave the towering trees of the roost site, which they originally did, though trees slowly succumbed to the burning of the fields around them. Counts there in the years 2011-2017 showed no more than 8 birds in the roost site and by 2017 there were none at the roost site.

By now we had more people interested in parrot conservation in Guatemala, but we didn't know if there were enough yellow-naped amazons left in the country to protect, given the huge depopulation in our study area, and where they might be. So, we started talking to people to see if they had wild parrots on their ranches. We also looked at Google Earth maps to locate likely areas as well as bird sightings to further add transects, and eventually ranged throughout the coast of Guatemala over the next couple of years with teams of 1-6 counters. We recruited and trained counters through counting workshops, which served as awareness and team-building exercises. We came up with MNDIs for several locations, and where the highest numbers of birds coincided with interested land owners and managers, we returned again and again to develop these locations as "hot spots" and to repeat counts so as to confirm our original MNDIs. Thereafter we began to monitor and protect nests at these locations as soon as we had raised funds. We selected 6 "hotspots" that held most of the parrots in Guatemala while continuing to visit ranches and areas where we heard there might be parrots.

While protecting nests, we continued to refine the MNDI of multiple sites, using this number to warn stakeholders of the urgency of parrot conservation. By simply eyeballing the placement of transects, and where there were "zeros" or very low numbers in the heavy agricultural areas, we estimated that there could only be 400 individuals left in the country. Our subsequent point counts continue to yield the presence of families, so we now know that not all nests are poached, and that there is hope for recovery of this species. The MNDI was the first step in developing what is a growing project in this country.

The primary aim of this technique was to locate hot spots that could be protected, during which time we also built up relationships and a working group that could address the many other needed aspects of parrot conservation.

Northern Honduras – Yellow-headed Parrots

There had been few reports of this species in Honduras, and that is why I was surprised to hear that there might be a population in this region. Upon my first visit I was able to work with the local conservation organization and local community members who showed me some areas where we saw a few individuals, but I didn't know if we were talking about 5 birds, or 200. The organization agreed to undertake a population survey. To start with we held a classroom training over a couple of days, and then some in the field trainings while also collecting data. The organization continued to conduct additional transects based on where they had heard of birds, and by adding up all of the transects we got a number of 115 MNDI. We determined that this was a large enough population to work with, and nest monitoring and protection began, along with education and awareness activities.

Unfortunately, the area continues to lose habitat to agriculture (a lot of it illegal) and poaching continues, and the project there has not continued. Given the number of years since any census activity, the transects need to be repeated with special attention given to possible cross overs between transects.

The primary aim of this technique was to see if there were enough birds to protect, and where to look for nests to protect and it worked well for that purpose. It will be used again in the future to see where the birds might be five years later. However, comparing the 2015 counts to future counts might not be that valuable because transects were only counted once previously with a variety of counters, therefore any significant differences to more recent counts might be due to error, and not a population increase or decrease. This technique, however, will be useful to detect the presence of young birds in the population, and hence will be conducted in July of 2020. We are fearful for this very reduced population as nests have not been monitored for several years and a lack of resources poses significant challenges for the humans wishing to protect this population. We hope they are still there.

Guanaja Island, Honduras Yellow-naped Amazon

Historically there has been a population of yellow-naped amazons **(***Amazona auropalliata caribae*) on this island in the Atlantic Ocean, but no one seemed to have an idea of how many were there. There had been partial counts and estimations in the past but this was before Hurricane Mitch devastated the island in 1998. Local conservationists on the island were interested in knowing the current population and how to count them. These people were eager to do the count, and they were experienced birders, so we skipped the step of classroom training and instead held just one training experience in the field in how to fill out the form, and then went to work because we only had 5 days. We employed the local poachers and buyers of parrots to help us count the birds and locate where they were, and within 4 days we had done enough counts to cover 40% of the island, never repeating an evening or morning count (we were in a hurry). After I left, the team continued to count for another 3 days, and in 7 days we had 75 % of the island counted yielding 323 individuals. This was much more than they had expected, and was enough to energize a full-fledged conservation project with people hired to lead the nest monitoring and protection along with ample education and awareness activities. Due to the rapid training and doing the first 4 days of both morning and evening counts, and only once per place, the accuracy was probably lower than usual. However this was countered by very good birders and poachers, and their diligent and painstaking process of working with me long distance to throw out duplicates. This count was conducted in October 2018, a time of often high density in roost sites for this species in other locations, but the following year's count was conducted in July and August as a means to capture the presence of family groups. The entire island was counted this time, and only evening counts were done. For a total of 17 transects the MNDI was 498 with 10.6% of the population consisting of first year juveniles. We know that many nests are fledging, though we need to continue the counts to see if the percentage of first-year birds might be higher if we counted one month earlier, or in successive years. The number of chicks seems low for sustaining the population, though we clearly don't know enough yet to make that statement definitively. The number of the total population is significantly higher than the year before, probably due in huge part to the methodology differences between the two years, but also perhaps because of the rapid and extensive conservation measures employed to locate and protect nests with hired guards and with local authorities.

The primary aim of using this methodology was to understand the location and behavior of the birds, and to see what kind of conservation strategies to employ for a team ready and willing to take extensive measures to protect the bird. The relatively high MNDI in both years encouraged the local conservationists to extend energy and resources due to the hope that perhaps in as short period of time they could end the poaching and have a stable and dense population once again on the island.

Chismuyu Bay Honduras – Yellow-naped Amazon

Throughout the range of the yellow-naped amazon on the Pacific Coast, the populations have been decimated with numbers of birds only in the hundreds (or less) in each country. Colleagues told me that there were still yellow-naped amazons on the coast of Honduras in a heavy agricultural area, so we decided that we needed to know how many birds were present that had taken refuge in the mangroves. We had no idea if there were 20 or 200. We were only able to spend a couple of days over the next couple of years doing transects, and came up with an MNDI of 94, with still multiple areas left uncounted. We estimate that there might be 200 in the area, taking their last refuge in the mangroves where it is somewhat harder to poach. We have not returned to the area since November 2017 to finish the counts, and at this point, we would need to repeat the previous one to get a more accurate count. We will begin first with the uncounted areas in case there is a surprisingly low or high numbers, while at the same time begin searching for nests and protecting them. A lack of resources has delayed this project, and makes its future uncertain.

The primary aim of this technique was to get a rough idea if there were only a handful of birds, or more that would warrant more extensive conservation efforts. We found that here there were enough birds, but they are spread out over a large and difficult flooded areas and mangroves.

Ometepe Island, Nicaragua – Yellow-naped Amazons

Ometepe Island is located in Lake Nicaragua, approximately 9 km from the mainland. The mainland has low numbers of yellow-naped amazons whose populations have decreased remarkably in the last decade (7). Beginning work thorough Fauna and Flora International showed that in one location on Ometepe, there were significant numbers of birds coming into roost, but that no standard techniques for counting the birds had been conducted. I was ecstatic on my first trip there to see that this one roost area had over 300 yellow-napes, not seen in my experience for decades. Wanting to understand this population here we held in the field training for about 6 counters to get a better count of the birds there. Then taking our team we selected 6 other areas where the local eco-guides had seen birds (the eco-guides were also the counters). We did two years of counts, in April 2014 and November of both 2014 and 2015, early on doing morning counts at some places, and evening counts at others, but by the end of 2015 doing both morning and evening in both locations. Admittedly our methodology was not as accurate as it could have been (not counting at the same time of day and in the same month) but we found that the MNDI of yellow-naped amazons was 1005 in our 7 sites, and unheard of and joyful density! We immediately began nest monitoring and protection, because we didn't know if there was any poaching on this island (there sure was we later found out!) and didn't continue the counts as we had limited resources which were better spent on protecting the nests and learning about the poaching rate.

Due to the down turn in the economy during the civil unrest in 2018, we received a donation to help employ the young tour guides outside of the nesting season, so we decided to conduct an island wide count with 14 different transects, all counted in the evening and all within a months' time when the young birds would still be flying with their families. This was an immense effort involving approximately 16 young people, all trained and placed in teams of multiple counters. I worked painstakingly with the leader to remove duplicates within the transects and between transects, and we were able to document an MNDI of 1869 yellow-naped amazons on the island. an even more amazing number!

During all of our counts we had placed people between transects and had seen very little movement between transects. Birds were mostly going up and down the volcanic slopes or staying within their transect areas, so we were fairly confident in the level of birds counted. We assumed this would be our final count for some years, as we wanted to extend our resources to nest monitoring and protection in the 4 densest areas of parrots, which the MNDI of each transect had exposed. To settle our thoughts on how much movement might exist between transects, or even between successive nights in the same transect, and in response to the still very low economy, the following July 2019 we counted all transects in our four targeted conservation hot spot communities at the same time. It was an immense and complicated effort, requiring much use of bikes, walking, trucks, and motorbikes to place our 16 people by the required time in each evening. Given the results found, we feel confident with our estimation of 2000 birds on the island and will from here on out put resources mostly into nest protecting and monitoring (as well as education and awareness). But we will count each of the 4 transects one night a week in every year as a baseline, even though that particular's night count might not yield a more precise number as opposed to counting over several nights. It will still give us an idea of the percentage of young birds in the flock. It will also serve as a means to involve and train more local people, and if extra resources become available, we can count each transect area 3-5 times within the same week's time.

The primary aim of this technique on Ometepe was to see how many birds were on the island and where the densest populations were to protect. Preliminary counts suggested that there was a high number on the island, which has an impact for the species of its entire range, as well conservation and ecotourist opportunities on the island. Before the down turn in the economy, Ometepe was a primary destination of international tourists, making it great place to not only generate income to support the local conservationists and their efforts, but a means to spread the word around the world.

Concepcion, Paraguay – Blue and Yellow Macaws

Conducting various point and roost counts, as well as casual moving transects (driving in the car with the windows down or walking along roads and trails) we had never observed blue and yellow macaws in this area (and only few red-and-green and hyacinth macaws). A well-funded initiative to release captive-bred blue and yellow macaws had started and stakeholders wanted to know if there were any still naturally occurring populations left in Paraguay. We had heard that they might be present on one partner ranch, so we assembled a team of birders, conservationists, and organizational members of the release project to conduct multiple transects on this one ranch over a period of 2.5 days. Very little training was done as we at first paired people up with more experienced birders and counters, and the emphasis was on the large macaws which are easier to identify. We studied a map of the ranch and overlaying it with terrain characteristics, previous sightings, and numbers and expertise of counters, we scheduled a way to place the transects to cover the majority of the ranch over these 3 days. We did not find any large macaws at all, but we did find only the second observation of a new species for Paraguay, the red-shouldered macaw, and were able to confirm a nest of yellow-faced parrots. Because the ranch administrator is keen on parrot conservation, we have alerted the ranch workers and will check in periodically to conduct counts and see if any blue and yellow macaws have been seen.

The primary aim of this technique was to survey for the presence of any blue and yellow macaws.

Rupununi, Guyana – the Sun Parakeet

The sun parakeet is an endangered parrot of the Guyana Shield and previous estimates of the parakeet were thought to be perhaps 200 individuals through the 2000's. No organized count had ever been conducted over the entire expanse of sightings within the same time period so we ventured to assist the village of Karasabai with the goal of understanding the numbers of parakeets. We did a partial count of the area using various transects in 2018, coming up with 137 as a MNDI. We aggressively threw out any possible duplicates, made somewhat easier because many of the flocks fly high, loudly, and in a direct line to foraging and roosting areas. We then held a classroom workshop in parrot conservation for 3 days, coupled with evening counts for 3 nights and then morning and evening counts for 3 days, with 22 people! We were able to cover a lot of ground, but still not as extensive as needed and somewhat haphazardly as our primary aim was training, and not surveying. Building on this training and previous counts, we now had the resources and understanding of where the birds were flying to do a more extensive placement of transects along their entire range. Our counts yielded an MNDI of 406 birds in 2019. We don't know if the population increased from the previously estimate 200 individuals, especially in light that the villagers were patrolling and enforcing their no-trapping rules, or if because it was the most extensive survey as of yet. Because this is such an endangered bird, we will repeat these same transects at the same time at least for another year, and if resources allow, every year thereafter. We also plan to do a quick one-week survey into neighboring Roraima Brazil to see what the MNDI might be like there, bringing with us a team of counters from Guyana and training new ones there.

Future Projects

We are planning on working with communities in Brazil to count sun parakeets, as well as with communities and parks to count in French Guiana and Suriname. We also need to return to Honduras to restart a project with yellow-headed amazons in Cuyamel, Honduras and with yellow-naped parrots in Chismuyo Bay, Honduras. Please contact us if you have knowledge of these areas, or would like to support our efforts in these specific areas. We also welcome collaboration in all our projects and perhaps yours as well!

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Glossary

Absolute Density: This refers to the number of individual parrots of each specie per acre, hectare, or square kilometer. For instance, we might say that there is 1 yellow-naped amazon per square kilometer.

Accuracy; The degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard. In parrot counting, accuracy means that the final count of the parrots reflects the true number of parrots in the area observed.

MNDI; The minimum number of distinct individuals. It means that for a given count, there may be more a higher number of distinct individuals, but no lower numbers.

Point; A place where a parrot counter is situated during the entire count period

Precision: This refers to the closeness of two or more measurements to each other. In parrot counting, this means that the count at one point or along one transect is precise if very similar numbers are arrived at during subsequent counts.

Relative Density: This is the ratio of different types of parrots counted at a given point or along a transect. We may not know the absolute or accurate number of parrots of each species in the area, but we can tell what the percent occurrence is of each species to another. For instance, if we count 100 parrots, and 30 of them are orange-fronted parakeets, and 70 of them are green parakeets, the relative density of each is 30% and 70% respectively.

Transect; A path along which one counts and records occurrences of the species of study. It is often linear, but in the case of using multiple points in parrot monitoring, the transect may take on a variety of shapes

Figures

Figure 1. Example of placement of points surrounding a forest patch so as to see parrots coming into a large roost area. This five-point transect surround forest patch was on Ometepe Island, Nicaragua. Points were placed where there was an open view and where all birds coming and going could be observed.

Figure 2. This shows the 4 main roost sites counted on Ometepe Island. Points “Pena 6” and “Totoca 5” were placed to look for movement between the Merida, Totoca, and Pena transects. Also notice how Merida 2 is placed off the linear placements of other points in the Merida transect because it up on the volcanic slope with a good view of the roost site below.

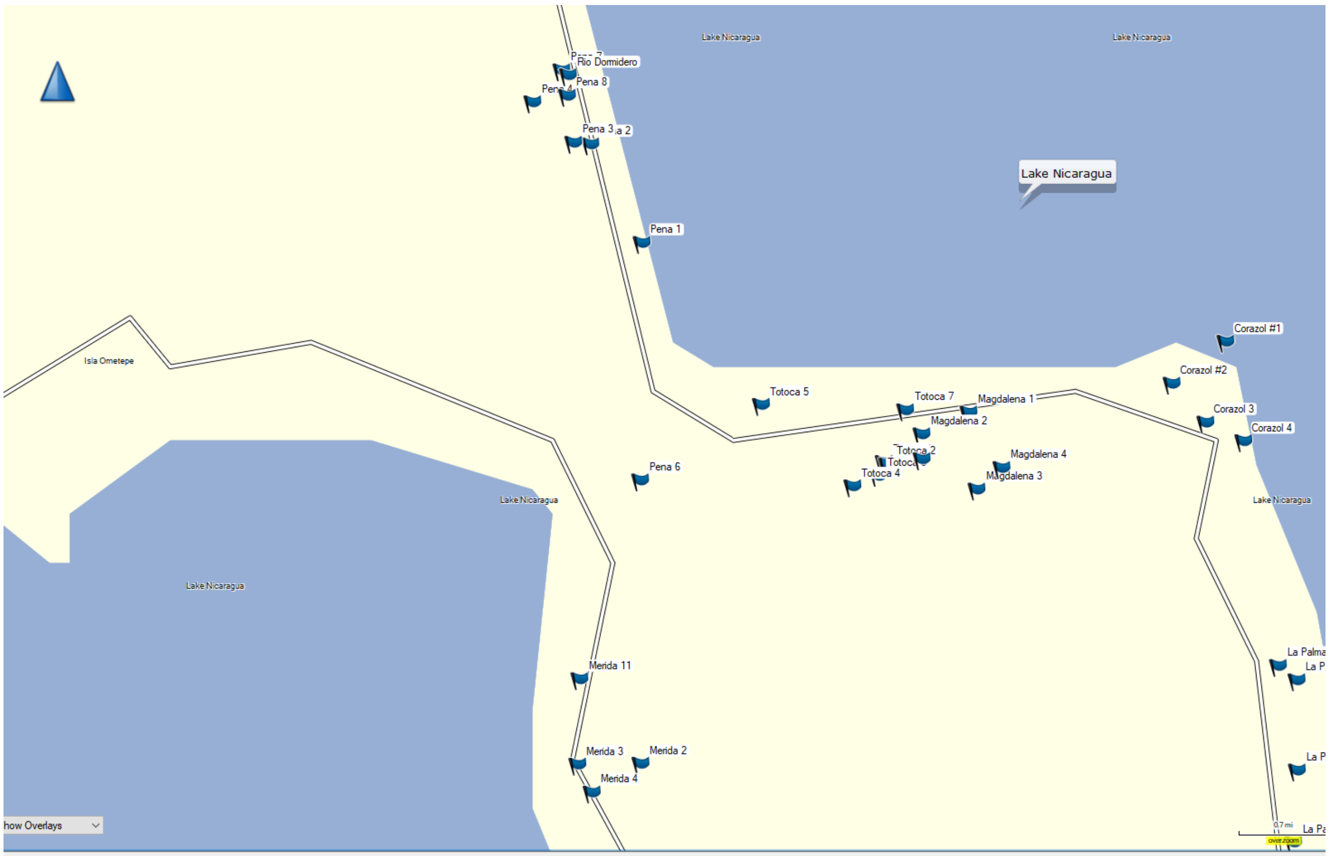


Figure 3. The counting form is one page, front and back, with the column on one side and the space for drawings on the back side. It is also available in Spanish. Electronic files of this are available at: https://www.oneearthconservation.org/resources

Counting Form

Name Transect/area:____________________ **#/Name Point:**_________ **GPS:**___________________________ **Date:**__________________

Begin Time:________ **End Time:**_______ **Person(s):**_______________________**Weather:**__________________________ **Page:**________

TIME	SPECIES	NUMBER BIRDS	DIRECTION	HEIGHT	DISTANCE	VOCAL? (Y/N)	LETTER DRAWING	COMMENT (AGE)
Summary:	**Species**	**Number**	**Singles**	**Pairs**	**3**	**4**	**5**	**#?**

Drawing: (flights with arrows, reference points, directions, compass)

Figure 4. Filled out counting form from Guyana counting a yellow-headed amazon parrot roost site. Notice how the counters fill in if they were duplicates at their point (last column to right) and also if they were duplicates with other points in the transect (checks and "x's" to left.

Counting Form

Name Transect/area: Karasabai Village East #/Name Point: Dankas pt #3 GPS: 21N 0218414 UTM 0444 9435 Date: 04 March 2020

Begin Time: 17:13 End Time: 18:41 Person(s): Jerondy & Nanne Weather: 5/cloudy windy warm Page: 1

TIME	SPECIES	NUMBER BIRDS	DIRECTION	HEIGHT	DISTANCE	VOCAL? (Y/N)	LETTER DRAWING	COMMENT (AGE)
17:17	BTP	2	SE - SW	15 m	80 m	Y	A	
17:23	BT P	1+2	E – W	10 m	100 m	Y	B	
17:23	YCA	2	S —	20 M	100 m	Y	C	
17:51	RGM	2	W – S	40 m	200 m	Y	D	
17:55	YCA	2	S —	25 m	60 m	Y	E	Duplicate of G
17:57	YCA	1	S — NW	25 m	100 m	Y	F	
17:57	YCA	2+1	S — NW	25 m	100 m	Y	G	
18:03	YCA	2	NW — N	10 m	60 m	Y	H	Duplicate of G
18:09	YCA	1+2	S – NW	25 m	100 m	Y	I	
18:12	"	2	S— NW	40 m	200 m	Y	J	
18:14	"	2	S —	10 m	60 m	Y	K	
18:14	"	2+2	SE—	25 m	30 m	Y	L	
18:15	"	2	SE – NW	20 m	60 M	Y	M	
18:15	"	1	SE —	20 M	30 M	Y	N	
18:21	"	1	NW— S	20 m	60 m	Y	O	Duplicates of N
18:22	"	2+2+1	NW – S	25 m	60 m	Y	P	Duplicates of L & F
							Q	
							R	
							S	
							T	
							U	
							V	
Comment	at 18:32 All parrots were very silents							

Summary:	Species	Number	Singles	Pairs	3	4	5	#?
	YCA	26	IIIIII	IIIIIIIIIII				
	BTP	5	I	II				

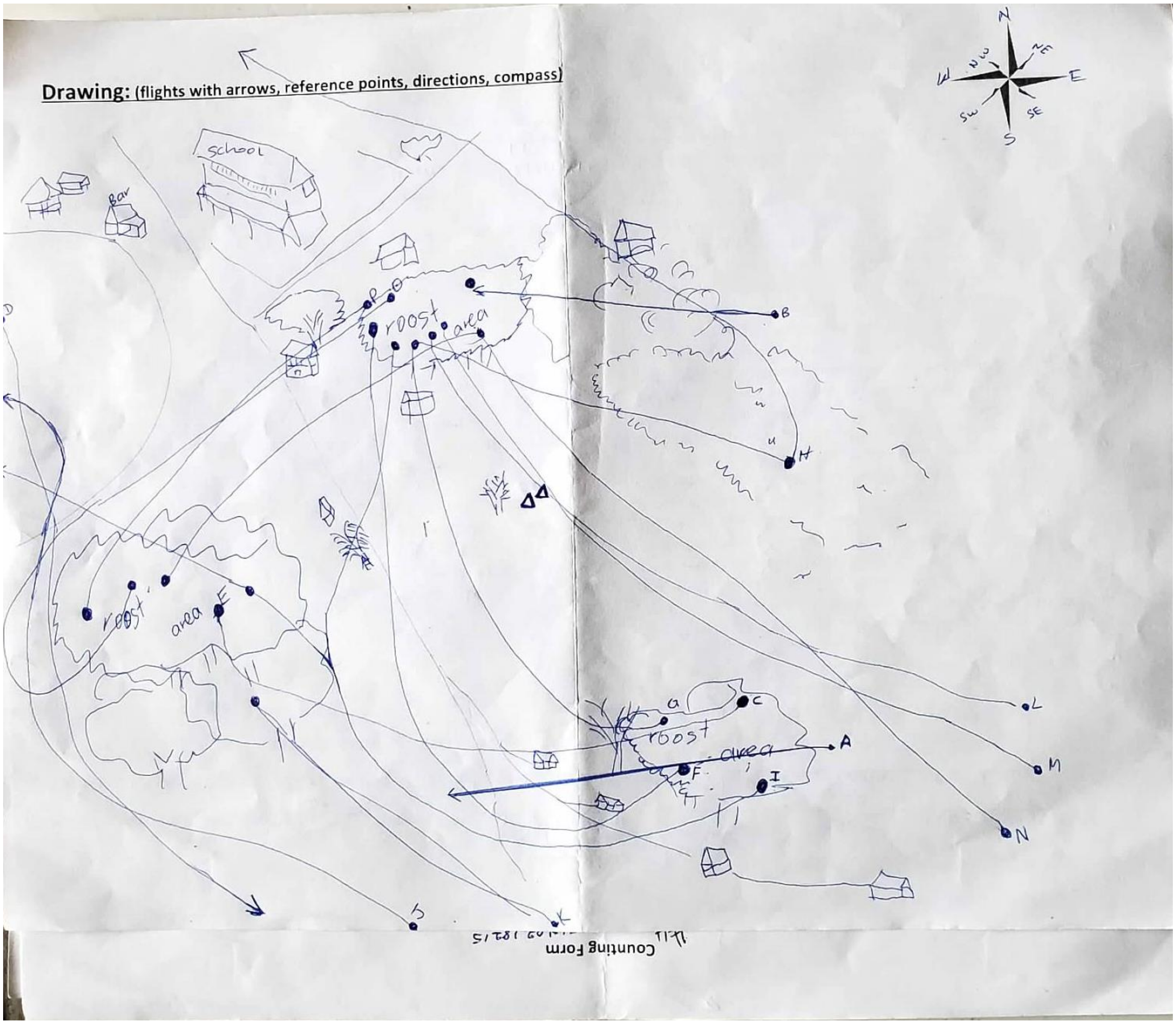

Drawing: (flights with arrows, reference points, directions, compass)
school
Bar
roost
area
roost
area
roost
area
N
NE
E
SE
S
SW
W
NW
Counting Form

Figure 5. Sometimes the maps are like works of art.

Figure 6. Sometimes the drawings are much simpler. The important thing is to include a compass in the drawing, lines for each flight, and location of counters.

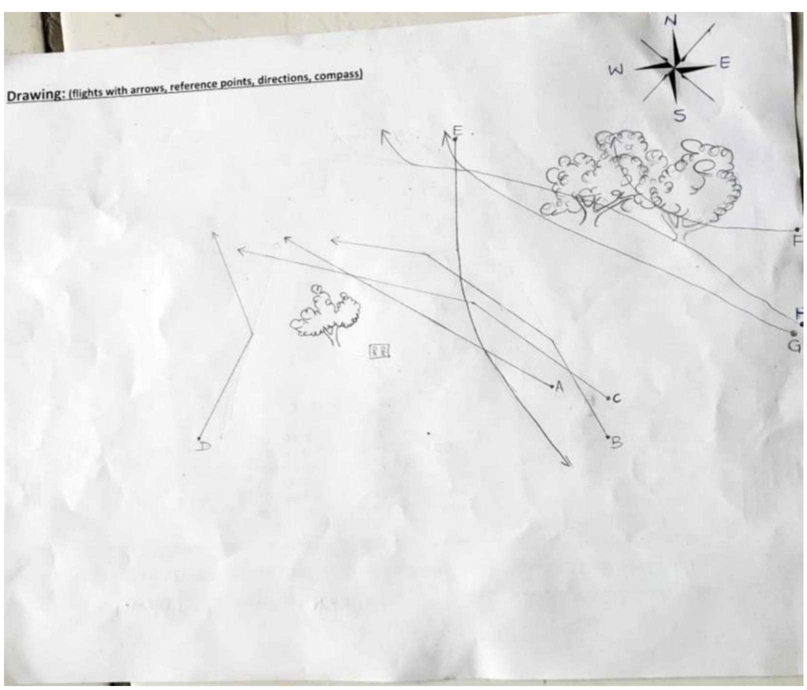


Figure 7. Map from a relatively high count of 109 individuals

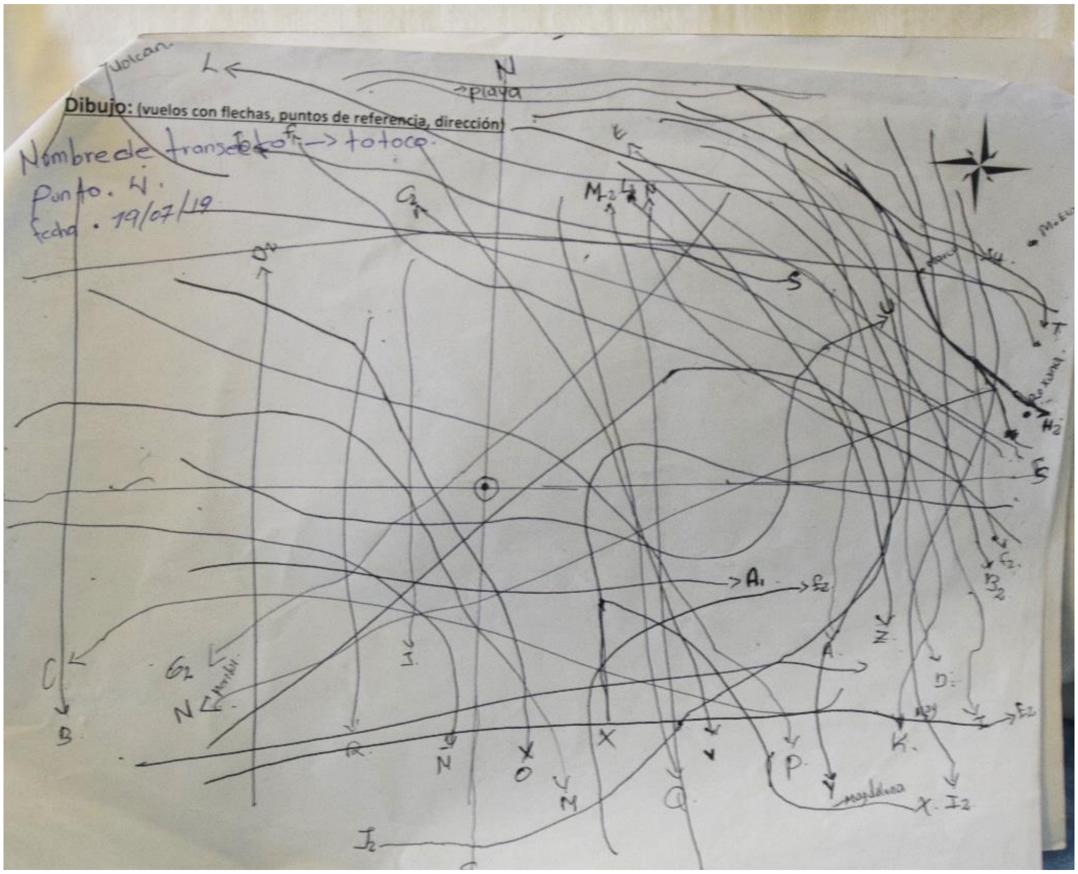


Figure 8. Form used to summarize multiple points in a transect. This form is available at https://www.oneearthconservation.org/resources

COUNT SUMMARY

Name Transect: ______________________ **Date:** ____________________ **Weather:**____________________________________

Number of Sites:__________________ **Names of Sites**____

Number People Each Site: ____

Leader Each Site: _______________________________ **Begin Time:**____________ **End Time:** _________

Observations: ____

Name Site	Species	Number	1	2	3	4	5	Groups	#Enter/Leave	To where?
TOTAL:										

Photographs

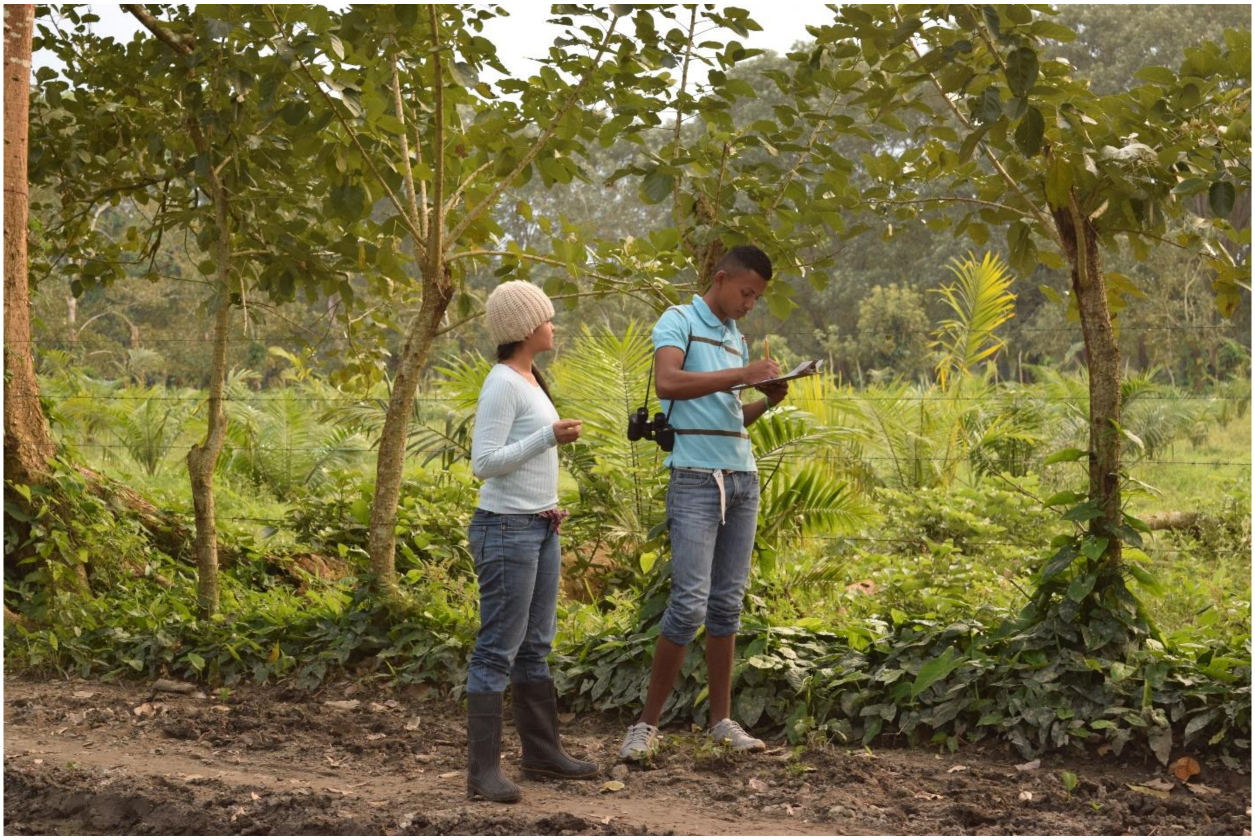
Training Before Counting, Nicaragua, Ometepe

Counting Team for 4 Transects, Ometepe, Nicaragua

a

Tabulating multiple points in a transect, Taka'lik Guatemala

Placing Team for Transects, Cuyamel, Honduras



Transect points often placed on roads where there are clearing or fields to either side, Cuyamel, Honduras

1Parakeet rangers on way to camping to reach far transects for surveying the sun parakeet, Karasabai, Guyana

In the field training, Karasabai, Guyana

Involving students and tourists in the counting, Iwokrama, Guyana

Quick picture taken to count yellow-crowned amazons and to age them (all appear to be adults), Suraname, Guyana

Quick picture to count Pacific parakeets - you have 5 seconds to count them before they go out of view, Guatemala. How many do you count?

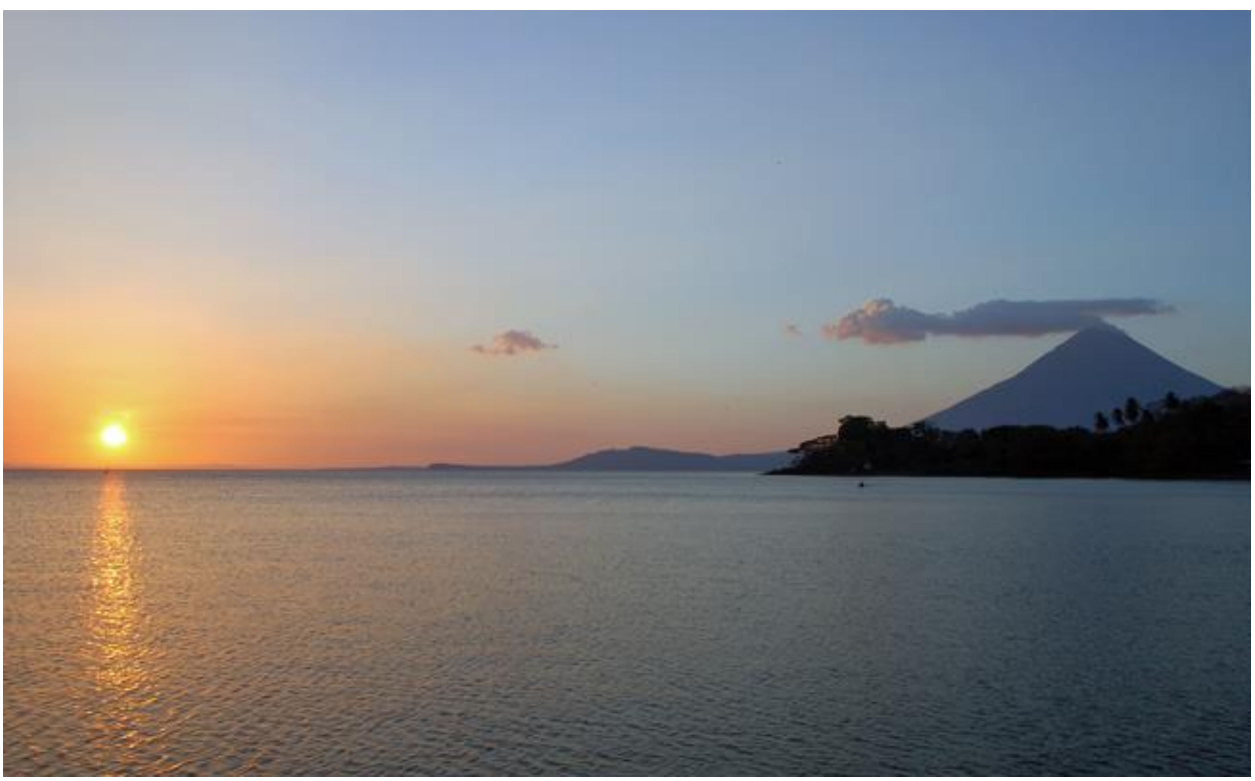
This group of yellow-naped amazons are counted as (2+2+2), Guatemala

Rock counting site on an island on Lake Nicaragua. Rocks and docks provided some clear views in the Solentiname Archipelago islands of Mancarron and Mancarroncito

Some transect points are nicer than others, Ometepe Island, Nicaragua

Quick shot of yellow-naped amazons, counted as 6 (all juvenile birds because little to no yellow on the nape)

Quick shot of yellow-headed parrots, counted as 3 (two younger birds?), Cuyamel, Honduras



My transect point situated on a pier, Ometepe, Nicaragua

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About the Author

LoraKim combines her experience as a wildlife veterinarian, Unitarian Universalist minister, and Certified Trainer in Nonviolent Communication to address the importance of both human and nonhuman well-being in living a deeply meaningful and vibrant life, as well as caring for self, family, relationships, organizations, and life all around. She serves as a Community Minister affiliated with the Community Unitarian Universalist Congregation at White Plans, NY and Co-Director of One Earth Conservation. She is an inspiring speaker, leading workshops and webinars all over the country in Compassionate Communication and Nurturing Nature. With over 33 years of experience working with parrot conservation in the Americas, she currently leads projects in Guatemala, Honduras, Nicaragua, Guyana, Paraguay, Suriname, and French Guiana. You can read about her life and work in her memoirs, Conservation in Time of War.