Rocky Mountain Bird Observatory

Point Transect Protocol

ROCKY MOUNTAIN BIRD OBSERVATORY

***Mission**: To conserve birds and their habitats*

***Vision**: Native bird populations are sustained in healthy ecosystems*

***Core Values**: (Our goals for achieving our mission)*

1. ***Science** provides the foundation for effective bird conservation.*
2. ***Education** is critical to the success of bird conservation.*
3. ***Stewardship** of birds and their habitats is a shared responsibility.*

RMBO accomplishes its mission by:

***Partnering** with state and federal natural resource agencies, private landowners, schools, and other nonprofits for conservation.*

***Studying** bird responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.*

***Monitoring** long-term trends in bird populations for our region.*

***Providing** active, experiential, education programs that create an awareness and appreciation for birds.*

***Sharing** the latest information in land management and bird conservation practices.*

***Developing** voluntary, working partnerships with landowners to engage them in conservation.*

***Working** across political and jurisdictional boundaries including, counties, states, regions, and national boundaries. Our conservation work emphasizes the Western United States, including the Great Plains, as well as Latin America.*

***Creating** informed publics and building consensus for bird conservation needs.*

Suggested Citation:

Hanni, D. J., C. M. White, J. A. Blakesley, G. J. Levandoski, and J. J. Birek. 2009. Point Transect Protocol. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 37 pp.

***Cover Photos**:*

Western Tanager by Jeff Birek – jeff.birek@rmbo.org

Contact Information:

David Hanni david.hanni@rmbo.org
Chris White chris.white@rmbo.org
RMBO Fort Collins Office
230 Cherry Street
Fort Collins, CO 80521
970.482.1707

ACKNOWLEDGEMENTS

We sincerely thank the authors of Rocky Mountain Bird Observatory's original point transect protocol (Leukering et. al. 2005): Tony Leukering, Michael Carter, Arvind Panjabi, Douglas Faulkner, and Rich Levad.

TABLE OF CONTENTS

I. PROJECT OVERVIEW

Rocky Mountain Bird Observatory (RMBO) in cooperation with Colorado Division of Wildlife, U.S. Forest Service, Bureau of Land Management, National Park Service, and other agencies, has developed a program to monitor bird populations that utilizes point-counts along habitat-stratified transects (i.e., point transects) as the primary sampling technique. We originally designed this program for the state of Colorado, but have since employed it in Wyoming, Black Hills National Forest in South Dakota, Kaibab National Forest in Arizona, and elsewhere. The point transect portion of this program has been designed to be statistically rigorous and biologically sound, and should produce data for analyses of population trends for most diurnal, regular-breeding landbird species. This document delineates the design and operation of our point transect program. We intend this protocol to instruct our field workers on how to run point counts and for others to follow when establishing monitoring projects of their own, so that the design and methods are comparable.

II. TRANSECT DESIGN AND OVERVIEW

The sampling design consists of 15 points spaced 250 m apart, connected by a transect line. Because points within a given transect are not independent of each other, the entire transect, rather than the individual point, is the sampling unit. Observers record all avian species detected at each point. In addition, observers also record certain species of concern along the line transect in between points. We estimate detection probability using Distance sampling (Buckland et al 2001) and Removal sampling (Farnsworth et al 2002). We then use the detection probability to calculate density estimates for species with large enough sample sizes.

The point-transect sampling effort is stratified by habitat. Stratification by habitat reduces variation among samples, allowing for greater statistical power, and also yields results that can be directly applied to management objectives. We established thirty 15-point transects within each habitat.

We determined the access point for each transect randomly, but all fall on or near a road running through the habitat or within one mile of the habitat (see "IV. Setting up New Sites"). We placed each transect's first point between 0 and 400 m (determined randomly) away from the access point, in a randomly determined direction that leads the observer into the target habitat. From point 1, each transect continues along a pre-selected random bearing for all successive points.

III. MATERIALS

Before heading out into the field, each technician should be sure s/he has the following (unless otherwise indicated below, RMBO will supply all materials):

A. **Timepiece** with a countdown timer and a chime;
B. **Binoculars** (*you must provide this);*
C. **Declination-adjustable compass** with sighting capability (i.e., a mirror);
D. **Clipboard** (with instruction sheets/lists attached);
E. **Writing utensils** in case you lose one (pencil or indelible ink pen) (*3 pencils will be provided by RMBO at the start of the field season; if you lose these you must provide additional writing utensils*);
F. **GPS unit** with grid locations loaded onto it;
G. **Rangefinder**;

H. **Extra batteries**;
I. **Data forms** sufficient for all the points planned that morning;
J. **Plant ID guide**;
K. **Master list of four-letter codes** and;
L. **Master list of weather and habitat codes**, taped to the clipboard.

IV. SETTING UP NEW SITES

Most transect for RMBO's point transect programs are established. For these, all you have to do is follow the waypoints pre-loaded into your GPS unit. In some cases, we do not have historic UTM coordinates for points. In this situation, you will follow the compass bearings and directions on the transect description sheet, and use your GPS unit to measure distances between points (250m). However, some of you may need to establish new transects. For each new site, select an access point on the site map that will provide the easiest access to that site. As a general rule, the access point should be located within or adjacent to the site, at a recognizable location that will require the least amount of driving to get to, but that will also provide a safe place off the road to park a vehicle. Avoid using tertiary 4-wheel drive roads whenever possible, as that will reduce the need for 4-wheel drive vehicles in the future. A good place for an access point is at the junction of 2 roads, which is usually well marked. While en route to the access point, **record clear directions** using mileage between junctions or turns whenever possible, to ensure that observers can find these sites easily in the future. Record the UTM coordinates at the access point using your GPS. For more details on establishing access points, see Appendix A.

A. Establishment of transects from roads that run through or adjacent to the target habitat

From the access point, use the GPS unit to measure the pre-determined random distance (0-400m; using random numbers table) along a pre-selected random bearing (0-360 deg) heading into the selected stand to get to point #1. See "B. Selecting random bearings for transects" below for more information on random bearings and distances. In many stands, the orientation and shape of the stand will force you to select a bearing from a very small array of possibilities. In cases where the random bearing will obviously quickly (in the first 1-2 points) and permanently take the transect out of the target habitat, you should select another bearing. The first point along the transect starts at the end of the random distance.

From the first point, continue along the pre-selected, randomly-determined bearing to all succeeding points. In cases where you run into the end of the target habitat, a private property boundary, or some other obstruction (e.g. cliff), you should backtrack to the last count station and randomly select (flip a coin) whether to turn right or left (if both alternatives are possible), then continue the transect *perpendicular (a 90 degree turn) to the original bearing* in the direction selected by the coin toss. If the shape of the stand does not accommodate at least one point in a direction perpendicular to the original bearing, randomly select a bearing on which to continue the transect from the range of possible bearings. Should you need to make further direction choices at habitat (or property) edges, repeat the above described process, but beware of boxing yourself in.

1. Establishment of transects from roads that do NOT run through the target habitat

Some stands are not directly accessible by maintained roads. In these cases, you will need to establish an access point along the road and then walk a bearing (or the most easily repeatable route – e.g. follow a trail) from the access point toward

the target habitat, that will reach it in the shortest possible distance (record this information under "transect description" on the field form. If you cannot see the habitat from the access point, check with the site map to see where the target habitat is and then walk toward the habitat. Upon reaching the target habitat, you are at the first point. From the first point, run the transect along the pre-determined random bearing that will take you through the stand. Should you hit a habitat edge or other obstruction after initiating a transect, use the protocol for such a situation found in "A. Establishment of transects from roads that run through or adjacent to the target habitat" above.

2. Establishment of transects in linear habitats

Transects in linear habitats are established in much the same manner as with other habitats, with a few exceptions. Select an access point that will ensure that all 15 points will fit within the site beginning from that access point (remember, 15 count stations, plus the random pre-transect distance requires about 4 km, or 2.4 linear miles of habitat). In other words, if your riparian site is only 2.5 miles long, don't start your transect in the middle if you don't have to! Transects that survey linear habitats (*e.g.* riparian habitats, some spruce and aspen sites) do not necessarily need to follow a pre-determined bearing, but should follow the habitat and observers should **attempt to stay in the middle of that habitat**. However, determining a pre-selected bearing (using the site maps and your declination-adjusted compass) that will take you through the targeted stand will often provide the easiest means of staying within the boundaries of a stand, especially in dense habitats such as aspen or spruce. Whenever possible, **avoid doing point counts along the edge of a linear habitat**, so that you maintain an equal chance of observing birds of that habitat at any distance (<u>especially short distances</u>) in all directions. Doing counts from the edge of a habitat results in increased distance measurements for your target birds in that habitat, while decreasing distance measurements for your non-target birds from adjacent habitats, leading to skewed habitat-specific density estimates. **If you must use a road or trail to get between points in a linear habitat, once your reach 250 m, go into the middle of the habitat to establish the count station if possible** (as long as it doesn't involve trespassing). One should also be cautious of maintaining adequate inter-point distances when laying out transects in linear habitats, as a meandering linear habitat will often require that more than 250 meters are walked by the observer in order to ensure that the 250 m interval (*as the crow flies*) is maintained between points. **At all sites, it is essential to use the "waypoints" feature on the GPS unit to ensure the proper inter-point distance.** Record your waypoints for each point, as well as the bearing from the last point.

B. Selecting random bearings and distances for transects

We will provide you with a random numbers table at the start of the field season. Field workers that establish transects **must** have one on hand. Before selecting a random bearing for a site, you must first determine the range of possible bearings you can select from for that site, based on the location of your access point. Use the site map and a compass to accomplish this. Set your compass to 0º (make sure you have set the declination accordingly for your area –e.g. 11ºE for CO, 12.5º E for the Black Hills-- check with your field supervisor if you are unsure what the declination is in your area) and lay it on the map so that the center of your compass lies *exactly* on top of the access point you have selected and so that North (0º) points toward the top of the page. Using a pencil, lightly draw marks for the two bearings that will provide the extremes in terms of potential bearings that will take you through the stand. Now, to randomly select a bearing from the table, look at the first three-digit number on the table that you have not yet used. If the

number falls within the range of possible bearings for your specific site, that is bearing you should use. If not, continue down the list until you find the first number that does fall within your potential range of bearings. Once you've used a number from the table, **cross it off and do not use it again**. For your next random bearing, start at the top of the numbers table with the next available *un-used* number and repeat.

C. Measuring inter-point distances

We will rely upon the "go to nearest waypoint" feature in the GPS units to ensure that points are located 250 m apart. This requires that the GPS unit remain on during the entire transect to continue gathering information from the available satellites (PLEASE make certain that you have extra batteries at all times – we will reimburse for the cost of batteries. A set of batteries in the GPS unit should last 2 to 3 transects. If your GPS unit is using batteries at a quicker rate please let us know and we will replace the unit). As you leave a point or the access point, use your compass to aim toward your next point. Also, use the "go to" function on the GPS to determine your bearing to the point that you are leaving. It is important to understand that this bearing will be the inverse of the bearing you are heading (e.g. if you want to travel on a bearing of 264 degrees, the GPS will be telling you that the bearing to the point you are leaving is 84 degrees). This function on the GPS will also tell you the distance to the point you are leaving. So, using the above example, you will have reached the next point when the screen displays that you are 84 degrees and 250 meters from the previous point.

Once you reach the next point, "mark" the point with your GPS unit (store the point in the unit's memory) and RECORD the UTMs in the space provided on the datasheet. When "marking" a point please label the point as follows: 1) start with project code (BH for Black Hills, CP for the Northern Colorado Plateau Network); 2) enter habitat code (AS=aspen, etc); 3) enter transect number; and 4) enter the point number last. *If your unit will only accept 6 characters, please leave off the project code*. So, point 8 on mixed-conifer transect number 12 in BH would be stored in the GPS memory as BHMC1208. If your unit will only accept 6 characters, you would record it as MC1208. We also record the level of accuracy (+/- *X* meters – displayed on the screen of the GPS) on the datasheets.

You need to record the UTMs on the data sheet for each point conducted, in case your GPS unit is lost or broken. You can do this after you complete a transect by accessing the waypoints in your GPS unit. However, you have to record accuracy while creating a waypoint, as the GPS unit will not display this information later. Sometimes, clouds, dense forest canopy, and steep canyon walls can make it more difficult to get an accurate reading, but this rarely happens and should not happen for more then a point or two during one transect. Check the batteries if you continue to get inaccurate or no readings. If, when you stop at 250 m, the location is unsuitable for detecting the birds (e.g. where your vision or hearing is significantly impaired), continue walking as short a distance as possible in order to establish the point where you can effectively hear/see the birds in the area. Then take the GPS location, record the UTM, and make note of the extra distance added to the inter-point distance. We will cover how to use the GPS units during the training session.

V. CONDUCTING THE POINT TRANSECT SURVEYS

Seasonal Timing

Point count transects should be performed after all migratory species have returned to the

area and as early in the season as possible, but beware of performing them too early and potentially counting a lot of transient migrants, or missing some of the breeders that have not yet arrived. Also, transects within a given habitat should all be surveyed in as short a period as possible--within three weeks; less time, if possible. Obviously, counts performed in grasslands in late May are not comparable to counts performed in the same habitat in early-July, as most locally-breeding species have completed nesting and are much less vocal in July than they were in May. By limiting the period in which transects in given habitats are surveyed, we reduce the amount of seasonal variability in singing rates, and hence detections, that we capture in our data. Please see Appendix E for the list of dates that are optimal for surveying transects in each habitat. In addition to seasonal timing, each individual point-count transect must be surveyed during the time of day that songbirds are most detectable. Surveys should begin approximately ½ hour before sunrise (once there is enough light to ID birds by sight) and finished before 11am (preferably before 10am).

There are **two aspects** to the collection of bird data along point transects: the **5-minute point counts**, and the **continuous line-transect count of low-density target species** observed between the first and last points.

A. Point Counts

You will receive a GPS unit with all of the points for your transects pre-loaded onto it. Follow the GPS unit to each point count station (we will practice this during training). We do not have waypoint data for some transects, so you may need to follow the bearings given on the transect description sheet to find each point. If this is the case, please record your UTMs so that we will have this information for next year. Upon reaching a point, fill out the GPS accuracy and habitat data on the field forms **first**. **DO NOT begin counting until after this is done** Upon reaching a point, record and label the waypoint in the GPS unit, and fill out the GPS accuracy and habitat data on the field forms **first** (including directions to point). **Do NOT begin counting until after you have done this** (however, do identify and make a mental note of the identification and locations of any birds flushed from around the count station upon your approach). Doing this first is important for two reasons: 1) it will ensure that you do not forget to write it down, and 2) it will allow the local birds to "settle down" somewhat after the disturbance you created when approaching the point. Please see **"Appendix A: Explanation of field forms and data codes"** for more instructions on how to record habitat and bird data.

1. Habitat Data

Pay particular attention to filling in the squares in the habitat blocks of the data form for each of the 15 points per transect **while at each point**. We will use the habitat data to relate bird use with vegetation features and habitat type, so please be as accurate as possible in providing these data.

2. Bird Data

After recording the general habitat data at the point count station activate your timepiece and begin counting and recording the birds you see and/or hear. **The count duration is 5 minutes**. Place a mark (draw a line between detections) on the bird datasheet between birds recorded in each one-minute interval during the 5-minute count (see "Appendix I: Sample Bird Data Sheet"). To do this, simply initiate the timer, and when you hear the first beep (at one minute), draw a line under the last bird recorded and keep recording new birds until you hear the second beep (at two minutes). Then, draw another line under the last bird recorded and continue to draw lines under the last bird detected in each one-minute interval until the 5th beep when the count at this point is over. Do NOT record any other birds after the 5 minutes are over, even if it is an "interesting" bird

(you could record this bird in the notes field if you so desire). If you do not detect any birds during an interval, record **NOBI** (No Birds) in that interval. We are providing a time piece that beeps every minute and you must learn how to use it properly (we will go over this at training). Please make certain that the time piece's beeper is on and is functioning as it is impossible to pay attention to the birds and to note how much time (by looking at your time piece) has passed at the same time. All birds detected during the 5-minute count period should be recorded using the ***correct 4-letter codes*** (See Appendix F for bird species codes; most are obvious, but please commit to memory those codes that are unusual and do not follow the general rules). You should also record birds flushed from the count station upon arrival (and measure their distance from the point), because we assume that these birds would have remained at their original locations were it not for the disturbance created by the observer.

For each independently detected bird, you should record:

1) the **species**, using the appropriate 4-letter code,
2) the **radial distance** from you to the bird,
3) **how** the bird was detected (by song, call, drumming, flying over the habitat, other aural cues, or visually),
4) the **sex** of the bird if known (if the bird is a juvenile, put in J for sex),
5) if it is a low-density target species ("99" birds, see Appendix B), the **bearing** from you to the bird, and
6) the **cluster size** and **cluster ID** code for any birds that observed as part of a cluster (i.e., non-independent detections).

While conducting counts, be sure to focus primarily on birds that are close to the point. While we do ask you to record all birds detected, distant birds have little effect on density estimates. However, missing close birds can have a significant effect on density estimates. Also, be sure to look and listen in all directions, including up. It is best to slowly rotate in place while you are counting; making three complete turns in the five minutes is probably adequate. **Don't forget to look up!** It is very important to stay in one place while counting. It is acceptable to take a step or two away from the point in order to identify a bird that you have detected from a point, but cannot identify from the point, but ***ALWAYS*** return ASAP to the point. Do NOT chase birds during the count. After the five minutes are up, you may chase down a bird that you couldn't identify on the point in order to get an identification for the point, but do not leave the point during the five minutes and do NOT record birds on the point count that were only found while chasing another bird. ***Remember: Consistency of methods and coverage is the key to useful data!*** Be aware of what is going on around you and realize that you may hear/see individual birds on multiple points. When at a point, **DO NOT** count an individual bird that you saw or heard on a previous point.

Example 1: On a point you see an adult male NOHA quartering low over the habitat. You mark it down for that point, finish the point, and walk to the next point. After writing down the point information, you start the count. You look in the direction of the previous point and see two NOHAs, one of which is an adult male. For the second point, you should only record one Northern Harrier, as you most probably recorded the adult male on the previous point.

Example 2: At the same point above, you hear two WEMEs singing, each bird roughly perpendicular to the point on opposite sides of the point count station. When you start the next point count, you hear three WEMEs, two from back by the previous point on opposite sides and one in the opposite direction toward the third

point. You would record only one WEME for the second point, as you already recorded two WEME from that area on the first point.

You should measure all distances using the Rangefinder whenever possible. If you can not get a direct line of sight to the location of a bird, use the Rangefinder to measure to a point close to that bird, and then add or subtract the additional estimated distance between that point and the bird to obtain the best possible distance estimate from the point to the bird. Distance-sampling relies upon the assumption that observers measure all distances accurately, so *always use your rangefinders as much as possible!*

Always measure distances to where you first detected the bird, not to where you first identified it. *For low-density target species observed at point counts, measure the radial distance to each bird* (or estimate when necessary) ***AND record the bearing from the point to the bird*** (see Transect counts, below). For birds that are vocalizing but not seen, try to pin-point their locations to a specific tree/bush, then measure the distance to that tree. If you are unable to pin-point its location to a specific tree/bush, then estimate the distance, but ***do not round distances*** *to the nearest 5- or 10-m interval*. Rounding distances causes heaping at popular values and makes analysis more problematic! If you see/hear a bird that is beyond the range of the Rangefinder, measure to the furthest object in the direction of the bird that the Rangefinder can measure to, and estimate the distance beyond that object to the bird. Add your estimate plus the measured distance and record the sum as the total distance.

B. Transect Counts (i.e. between points)--Conduct a continuous line transect count *between the first and last points* of the transect and record all observations of low-density target species (99 birds, see Appendix B) and other rare or unusual bird species. For each low-density target species detected, you should ***measure (or estimate) radial distance and take a bearing*** *from your position on the transect to the target bird*. Use your compass to sight in the direction of the bird and record the bearing in the appropriate space on the field form. Make sure that you are on the exact bearing from your previous point to your next point before measuring and recording this data. ***You should record bearings for all low-density target species detected on transects, regardless of whether you record them on points or while in between points.*** Do not forget to take a bearing for low-density targets detected during point counts, as the time spent at point counts is part of the *continuous* line transect. Fill in the "How" and "Sex" columns for each low-density target just as you would for any other bird. For all low-density target species observed between points, record "99" as the point number. ***Record any species on the "99" list or that you think might be rare for the area you are surveying in.***

While walking between points, move at a constant speed and concentrate on listening and looking for target species. Keep your eyes and ears open and spend as little time as possible looking down. However, do watch where you are going enough to follow the correct compass bearing and avoid hazards. If you detect target species as true flyovers (i.e., they are not using the habitat), enter the species code and "F" in the how detected column, but do not estimate distance to the bird(s) unless they land. If you already recorded an individual bird on a point, do NOT count it again. **However, if you record a target bird in between points, and then while conducting your next point count you hear/see <u>that same individual</u> bird again, remove it from the "99" category, add it to your point count, and treat it as though it was first detected during that point count.** The line transect begins after point one has been conducted and ends after point fifteen has been conducted, so do not record any 99 birds observed outside of this time frame. You can add these birds to the notes section, but not the point count data.

When entering the point count data into the database, be sure to enter any 99 birds recorded between points with the point you came from, not the one you are going to. So, if you detect RNSA while going from point two to point three, you would enter it in the database along with the birds you detected on point two. Also, be sure to check the box indicating this bird is a 99 bird and leave the space for time period blank, as it was not detected during the five-minute interval.

VI. POTENTIAL PROBLEMS WHEN CONDUCTING POINT COUNTS

A. Window species

This is "listening through" (not detecting) a particular common species because you are habituated to it (Mourning Dove is a common window species).

B. Look and Listen everywhere

Be sure to look up regularly, particularly in taller forest types and, particularly if you are wearing a hat. **Do not wear sunglasses or hats that can affect your hearing while counting birds!** This includes caps that pull down over your ears as well as full-brimmed hats that can deflect sound away from your ears. Be sure to look and listen in all directions (try to look and listen in all directions equally).

C. Stand at Points

Do not sit or kneel as this can reduce the number of individuals recorded, by decreasing visibility, audibility and dexterity. If you are tired, take a short break after the point count. As long as you start early, you should have plenty of time to rest along the way.

D. Recording Data

Unless specifically instructed, do not use a second person as a recorder; this can enable the observer to record more birds (or fewer, if the recorder detracts from the job at hand or creates more disturbances). We may occasionally assign someone to conduct point counts with you, and you will note this person's presence on the datasheet.

E. NO Pishing

Do not attract birds to you. Pishing is permissible after the count in order to attempt to identify an individual that was not identifiable on the count, but do not add other individuals after the count that were not first detected during the count period.

F. Airplane (and other) Noise

If audibility of birds is reduced by mechanical noise, interrupt the count (i.e., stop your timer), and restart when the noise abates so that the total time still equals a five-minute count.

G. Guessing

Never guess on the identity of a bird. Instead, use an unknown code (e.g. unidentified sparrow - UNSP) for those individuals about which you're not sure. However, recording a lot of unidentified birds is an indication that you need to learn/practice more before performing point counts.

H. Know the Area

The day before conducting a point count transect, check out your survey area and familiarize with it so you know what to expect. Plan out an access route during the daylight the day before, that way you will be able to find your way easier if you have to

hike in the dark the next morning.

I. Practice

Practice in the habitat before counting for real. Be familiar with the songs and calls of all species found in a habitat before conducting point counts in that habitat. Use habitat-specific bird data queried from the RMBO Avian Data Center website (www.rmbo.org/public/monitoring/countseffort.aspx) along with audio recordings to practice before (and during) the field season.

J. Weather

Weather can always be a factor when conducting point counts. Never conduct a point count when it is raining, as birds will not be very active and visibility may be poor. Also, do not conduct a point count if the wind is strong enough to hinder your ability to hear bird calls and songs, as this will affect the number of birds you are able to detect.

VII. LITERATURE CITED

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling. Oxford University Press, London, UK.

Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point count surveys. Auk 119: 414-425.

Leukering, T., M. Carter, A. Panjabi, D. Faulkner, and R. Levad. Revised 2005. Rocky Mountain Bird Observatory Point Transect Protocol. Unpubl. document. Rocky Mountain Bird Observatory, Brighton, CO. 29 pp.

APPENDIX A. EXPLANATION OF FIELD FORMS AND DATA CODES

Please refer to Appendices G, H, and I to view example data sheets while reading the information below.

I. Transect Description Sheet

A. Observer Initials
Record your first, middle, and last initials here.

B. Date Conducted
Record the date the transect was conducted

C. Map Accurate
If the topographic map does not accurately reflect the transect, check no here so that we can make changes to it for the following field season.

D. Transect Accessible to
Please record how accessible the transect is (all vehicles, high-clearance, or 4WD). It is important for us to know the accessibility of each transect so that we can assign them to field technicians according to the type of vehicle they drive.

E. DeLorme Page
Don't forget to record the DeLorme page and coordinates the transect is on. This allows future field technicians to quickly locate the transect on the road map.

F. Access Point UTMs
See "H. Directions to Access Point" below.

G. Time Required to do the Transect
It is helpful to have an idea of what to expect before conducting a transect. Some transects are located on easy terrain and can be conducted relatively quickly, while others are on very difficult terrain and take a long time. Please record the amount of time it took you to conduct this transect so future field technicians can plan accordingly. If the transect required an hour hike to access it, include that time as well. **Note**: **If the transect is located far from a road and requires you to backpack in the day before, record how many *days* the transect took you to complete.** This will help future technicians to allow time for these transects.

H. Directions to Access Point (VERY IMPORTANT!)
We will provide you with a transect description sheet and topographic map for each transect assigned to you, as well as a road atlas for your study area. The transect description sheet will contain road-based directions on how to find each transect. If the directions are incomplete or inaccurate, please record updated directions on this sheet and enter these directions into the database later. Provide explicit directions from some nearby town, major intersection, or geographical feature readily found on a map to the access point in the space provided for directions on the transect description sheet. Provide mileages from intersections or other landmarks using your odometer. Try to locate the most logical and efficient location to access each transect. This location will become the Access Point. This point is the end goal for the directions you provide. For all sites, take GPS readings and record **UTM coordinates** for each access point. Also, **be explicit in your description about the *exact location* of the access point** (e.g. "the right post of the green metal gate" or "the NE

corner of the cattle guard").

Be as clear and accurate as possible when recording directions. Remember, someone will use your directions next year to find these transects.

Example: CO-PP17 - From intersection of US 160 & US 84 E of Pagosa Springs, follow US 84 S for about 5 mi. and turn right onto FR 651 (8 Mile Mesa Road). Continue on FR 651 for 4.7 miles to a fork. Take the right fork to a lookout tower in 0.6 mile. The access point is the outhouse near the fire tower. DeLorme page 88 C2.

I. Transect description

Provide the **distance** and **bearing** *from the access point **to** the first point* (do not provide bearing from first point back to the access point). Then, provide the bearing you follow to each of the remaining points along the transect. You should have bearings provided to you from previous years. If no bearings are given and you have GPS coordinates provided in your unit, please record the bearings as you go. To do this, use the "go to" function on the GPS to determine your bearing from the last point. It is important to understand that this bearing will be the inverse of the bearing you followed to reach the current point (e.g. if you traveled on a bearing of 264 degrees to reach the point, the GPS unit will tell you that the bearing to the point is 84 degrees). Try to adhere to the bearings as much as possible. In some situations, such as when you are conducting a transect in a linear habitat, it becomes more important to stay within the target habitat than it is to follow the bearings exactly. Use your best judgment in this situation, but try to follow the directions as much as possible. Always be sure to record your bearing from one point to the next, as this information is crucial to the transect aspect of the point-count transect. Feel free to provide *between-point accounts*, when necessary, describing the topography, habitat, landmarks and/or other features that you pass prior to arriving at the next count station. ***It is especially important that you record any turns, changes in bearings, or other deviations that you make from the original transect bearing.*** *As this is a long-term monitoring program, the importance of providing detailed directions/descriptions for each transect cannot be overstated!* GPS locations alone are not always sufficiently reliable as the accuracy of GPS locations can vary significantly.

J. Notes, Updates, and Camping Information

Provide directions and a description of camping options in the area. Sometimes, camping is available right at the Access Point. If not, then record direction to where you camped and provide UTMs for that location. It is important for future field technicians to know what their camping options are before arriving at the transect. If camping is unavailable (i.e. transect is surrounded by private land) then record where you stayed.

Enter information relevant to the site, problems encountered during the transect, interesting birds seen, cool scenery, or other tidbits that either don't really fit in other places or that future surveyors might find interesting.

II. Vegetation Data Sheet

A. SITE DATA

1. **Observer:** Enter your first two initials *and your full last name*

2. **Date:** Enter the date in the format: MM-DD-YY

3. GPS Unit #: Enter the number from the RMBO silver property tag on the back of your GPS unit

4. Program: Enter the two-letter code identifying the program to which the point transect belongs (e.g. CO, WY, BH, NM, CP)

5. Transect ID: Enter the 4-character code identifying the transect and number (e.g. AS08)

6. Access Point: You should enter the access point in the same manner as the point UTMs, using 00 as the point number. Mark this point in your GPS unit as well.

7. Time: Enter start and stop times for entire transect (not individual points) using 24-hour clock

8. Sky: (start and end)**:** Enter one-digit codes at beginning and end of transect (not at points)

0=0-15% cloud cover *1=16-50% cloud cover* *2=51-75% cloud cover*
3=76-100% cloud cover *4=fog* *6=drizzle*
You shouldn't survey in any other conditions!

9. Wind: (start and end)**:** Enter one-digit codes at beginning and end of transect

0=Less than 1 mph; smoke rises vertically
1=1-3 mph; smoke drift shows wind direction
2=4-7 mph; leaves rustle, wind is felt on face
3=8-12 mph; leaves, small twigs in constant motion; light flag extended
4=13-18 mph; raises dust, leaves, loose paper; small branches in motion
YOU SHOULDN'T SURVEY IN ANY OTHER CONDITIONS!

10. Temperature: (start and end)**:** Use °F (if you do not have a thermometer estimate to nearest 5°)

11. UTM Data

Record GPS Accuracy for each point here. If no waypoint data is available for a transect, please record this information while you conduct the transect. This will ensure that we can provide this information in the future. Follow the instructions below when recording UTMs on the data sheet. Please note that if we provide you with UTMs, you do not need to spend time recording these coordinates on the data sheet.

a. Zone: Record the zone in which your UTM locations occur (typically 12 or 13)

b. 8-character Point ID: enter the 2-character project code, then enter the 4-character transect ID code on each line so that the resulting 8-character point ID code is a unique code combining the transect ID and the point number (e.g. COHR0801). It is imperative that you enter this 8-digit code into the GPS unit so that we can accurately identify each stored waypoint in your GPS when we download them to a computer. If your GPS unit will only store 6 characters then leave off the project code from the point ID (e.g. HR0801).

You can enter these codes into the GPS unit either at each count station or upon completing the entire transect, but it is important to keep up with this aspect of the data entry daily, so that important GPS locations are not lost.

c. Easting and Northing: enter the Easting and Northing from the GPS reading that corresponds to each 8-character point ID at each point count station. This will provide important back-up data should the GPS be lost or stolen. **Be sure to fill in the entire UTM reading, not just the last three or four digits which changed from the last point. Many data entry errors result from this shortcut.**

d. Level of accuracy: enter the level of accuracy that is displayed on your GPS screen (+/- X meters). You must do this in the field at each point, since this information cannot be stored in the unit along with the UTMs.

B. Habitat Data

Unlike the bird data, which we record to an unlimited distance from each point, we only record habitat data within a 50-m radius of each point.

1. Point Info

a. Distance to road: Enter the distance in meters for **EACH** point based on your best knowledge of the site. **You should ignore roads beyond 100m**. *For our purposes, a "road" must be substantial enough so that it either causes a significant disruption of the understory vegetation OR a break in the canopy*. For example, a grassy 2-track running through an open meadow should not be considered a road, whereas a gravel or dirt road that forms a 3 to 4-m wide break in the grass cover would be considered a road. Similarly, an old, pine needle-covered logging track in an open forest situation is not a road, whereas a logging road that causes a clear and wide break in the woody understory vegetation or in the forest canopy is a road. We will cover this topic thoroughly during the training session.

b. Private Property: Enter "Y" for yes and "N" for no for **EACH** point.

c. Level of accuracy: enter the level of accuracy that is displayed on your GPS screen (+/- X meters) when you arrive at each point. You must do this in the field at each point.

2. Overstory (forested habitats only)

a. Structural stage: At each point-count station, identify and record *the structural stage that best describes the overstory trees* within a 50-m radius of the point-count station. Please use the following scale (see Appendix C for detailed habitat specific information on structural stages):

1) grass-forb (i.e., no or very few overstory trees present);
2) shrub-seedling (i.e., generally trees below head height);
3) sapling-pole;
4) mature;
5) old-growth.

b. Canopy Cover: Estimate closure of the combined canopy trees to the nearest 10 percent within a 50-m radius of the point-count.

c. Mean Canopy Height: At each point-count station, estimate the *average*

height to the top of the canopy trees (in meters) within a 50-m radius circle to the nearest meter. Use a rangefinder to help gauge estimates.

d. Species Composition: Identify the dominant tree species in the overstory and record the ***relative* abundance (%)** of the total overstory occupied by each species within a 50-m radius of each point-count station; you can list up to five species. Note that if only one tree species is present in the overstory, the relative percent should be 100%, regardless of how much of the circle the tree species occupies. Record tree species on the data form using the correct 2-letter vegetation code (see Appendix D for plant species codes). Note that Snags (SN), dead trees (DC or DD), and dead burned trees (BU) should be considered here. Estimates in increments of 10% are adequate in most situations. However, if there are only a few individuals of a certain species, use smaller percentages to accurately reflect that while being sure that the total of all species sums to 100% (i.e. DF 98%, SN 2%).

3. Mid-story (forested habitats only)

Sub-canopy species: You should only fill out this section if, ***and only if***, there is a *distinct* sub-canopy comprised of individual trees different from those making up the overstory. Enter up to three species' two-letter codes in the spaces provided (see Appendix D for plant species codes) in descending order of abundance. If there is no distinct sub-canopy, leave the provided spaces blank. This evaluation should not include foliage on mid-story branches from overstory trees, only those distinct trees that form a canopy (even if it is only one tree) below the overstory canopy.

4. Shrub layer

Use this category to estimate the amount and species makeup of any woody shrub layer (*including* seedling trees) present. Generally, shrubs are >0.5 meter high and <5.0 meters high. Anything taller than 5.0 meters should be considered part of the sub-canopy (e.g. very tall oaks or aspens that are of greater height); anything shorter than 0.5 meter should be considered in the ground cover category (except for the rare instances where there is a distinct shrub layer that are all less than 0.5 meter (sage transects) – in this case, record all shrubs species as a shrub layer and estimate cover as usual).

a. Shrub Cover: Estimate the *total* percent coverage of all woody shrub species AND seedling trees present within 50-m of the count station to the nearest 10%.

b. Mean height: Estimate the average height to the nearest 0.5 meter of the shrub layer.

c. Species composition: Identify the shrub species (including seedling trees) present and record the *relative* percent of the total shrub layer occupied by each species within a 50-m radius of each point-count station; you can list up to five species. Note that if only one shrub species is present, the relative percent should be 100%, regardless of how much of the circle the species occupies. Record shrub species on the data forms using the correct two-letter vegetation code (see Appendix D for plant species codes).

5. Ground Cover

a. We classify ground cover into five categories:

1) woody vegetation below 0.5 m (roughly knee height) including cacti;
2) dead and downed trees (also of a minimum of 6" dbh);
3) broad-leaved herbaceous plants and forbs;
4) bare ground (including rocks) and/or leaf litter; and
5) grass.

b. Cover: For each of these categories, estimate the *total* percent of ground cover within 50 meters of the count station that qualifies for each. In most all cases, the categories in this section will add up to 100%. The only time this won't happen is if you have some ground cover type that is not on the data sheet (i.e. water). If water is present at a point, make a note of it at the bottom of the vegetation data sheet

Note: Please put a "0" in the box for any ground cover category that is absent from the 50-m circle, rather than leaving it blank.

c. Grass height: Estimate in centimeters the average height of the grass within the 50-m radius. Learn where 10cm, 20cm, 30cm, etc. are on your leg as a guide. You can also use your data sheet. 8 ½ " x 11" = 21.5cm x 28cm.

6. Croplands

If the point you are surveying is in cropland, please specify whether it is **bare (plowed), fallow, or active (and indicate crop species if known).** Write these data in across the applicable row for the point in the section **Shrub Layer**.

7. Other (Y/N)

a. Human structures: Record either Y or N to indicate the presence or absence of human-created structures (e.g. cabins, bridges, mine shafts, etc) within a **50-m** radius of the count station. This includes any human structure that would influence (positively or negatively) the detection or the behavior of birds in the area, such as something that a bird could use for perching or nesting (e.g. windmill, gas well, mine shaft, building, or power pole). For example, you would not need to record a stop sign in a forested area because there are already plenty of places for a bird to perch. However, you would record a stop sign in grassland, as it provides a perch for singing that is higher than the surrounding vegetation.

b. Cliff/rock: Record either Y or N to indicate the presence of cliffs or large rocky outcrops within a **50-m** radius of the count station.

c. Prairie dog town: Record either Y or N to indicate the presence of a prairie dog town. Abandoned towns will be marked as Y.

d. Prairie dog presence: Record either Y or N to indicate the presence of prairie dogs. If you have reason to believe a colony is active, but they are all inside (excessive heat or cold), mark Y. Look for fresh sign such as scat or diggings.

e. # of Snags: Count the numbers of snags (>3 meters high, >6 in. dbh) within a **50-m** radius of the count station.

III. Bird Data

A. General Info

It is extremely important to fill in this data at the bottom of each and every bird form. If a bird form does not have this information and it becomes separated from the vegetation data sheet, then there is no way for us to know what transect the data came from. This data would become useless and an entire day's worth of data collection would be lost. Before starting your first point count, be sure to fill out this information:

1. **Observer:** Fill in your first, middle and last initials on all pages of the bird form.

2. **Project:** Fill in the 2-letter project code on all pages of the bird form (i.e. Colorado=CO, Black Hills National Forest=BH).

3. **Transect Name:** Fill in the 4-character transect ID code (habitat and number) on all pages of the bird form (i.e. AS14).

B. Point Data

1. **Point #:** Enter the number of the point (1-15) on the transect**. NOTE:** for entries for low density species *between points* enter "99" (see below for more information on "99" birds).

2. **Species:** All birds detected during the 5-minute count period should be recorded using the correct 4-letter codes (See Appendix F for bird species codes; most are obvious, but please commit to memory those codes that are unusual and do not follow the general rules). If you ever record a bird and are unsure of the four-letter code, make a note of it in the notes section at the bottom of the page to avoid confusion later.

Never record the same bird twice. If you already recorded a bird on an earlier point and detect it again at the next point, do not record the bird again. We do not want to double count any birds.

PLEASE, PLEASE use correct codes, as it makes data entry and analysis easier. Species that cause particular problems for observers include: **Northern Shoveler** (NSHO, not NOSH), Ring-necked Pheasant (RINP, not RNPH), **Western Wood-Pewee** (WEWP, not WWPE), **Gray Jay** (GRAJ, not GRJA), **Tree Swallow** (TRES, not TRSW), **Bank Swallow** (BANS, not BASW), **Barn Swallow** (BARS, not BASW), **MacGillivray's Warbler** (MGWA, not MAWA), **Yellow Warbler** (YWAR, not YEWA), **Yellow-rumped Warbler** (AUWA - for Audubon's Warbler, MYWA for Myrtle's Warbler, not YRWA), **Lark Bunting** (LARB, not LABU), **Savannah Sparrow** (SAVS, not SASP), **Lazuli Bunting** (LAZB, not LABU) and **Red-winged Blackbird** (RWBL, not RWBB).

If you detect a bird that you are unable to identify, use the code **UNBI**. Never guess on the identity of a bird, because this amounts to falsifying data. If you are unsure, we would prefer you to record UNBI rather than incorrectly identify a bird. However, recording a lot of unidentified birds is an indication that you need to study up and practice more before performing more point counts. Following is a table of unidentified bird codes you should use:

Unknown Bird	Code
Unknown Accipiter	UNAC
Unknown Bird	UNBI
Unknown Blackbird	UNBL
Unknown Buteo	UNBU
Unknown Chickadee	UNCH
Unknown Duck	UNDU
Unknown Empidonax	UNEM
Unknown Falcon	UNFA
Unknown Finch	UNFI
Unknown Flycatcher	UNFL
Unknown Grouse	UNGR
Unknown Gull	UNGU
Unknown Hawk	UNHA
Unknown Hummingbird	UNHU
Unknown Jay	UNJA
Unknown Oriole	UNOR
Unknown Owl	UNOW
Unknown Raptor	UNRA
Unknown Sandpiper	UNSA
Unknown Sparrow	UNSP
Unknown Swallow	UNSW
Unknown Vireo	UNVI
Unknown Warbler	UNWA
Unknown Woodpecker	UNWO
Unknown Wren	UNWR

3. Measuring Distances: Using your Rangefinder, measure the distance from the point to each and every individual bird detected during the count and record the distance in meters on the data sheet under "Radial Distance". If you detect a bird beyond one kilometer (1000m), fit number in the three spaces provided as best you can. **Please note that we record radial distance (horizontal distance), not actual distance.** If you detect a bird singing in a tree directly above you, the distance would be 0, not how far the bird is above you. We will review this during training.

You should measure all distances to birds using your Rangefinder whenever possible. If you cannot get a direct line of sight to the location of a bird, use the Rangefinder to measure to a point close to that bird, and then add or subtract the additional estimated distance between that point and the bird to obtain the best possible distance estimate from the point to the bird. Distance-sampling relies upon the assumption that you measure all distances accurately, so always use your rangefinders as much as possible!

Always measure distances to where you first detected the bird, not to where you first identified it. For birds that are vocalizing but not seen, try to pin-point their locations to a specific tree/bush, then measure the distance to that tree. If you are unable to pin-point its location to a specific tree/bush, then estimate the distance, but do not round distances to the nearest 5 or 10 meter interval. Rounding distances causes heaping at popular values and makes analysis more

problematic! If you see or hear a bird that is beyond the range of the Rangefinder, measure to the furthest object in the direction of the bird that the Rangefinder can measure to, and estimate the distance beyond that object to the bird. Add your estimate plus the measured distance and record the sum as the total distance.

Every bird recorded on point counts must have a radial distance measurement associated with it! This is imperative! Because our monitoring programs rely on Distance-sampling techniques and analyses, birds recorded without associated distances are essentially useless data that we cannot use in analysis! We will further explain the premises behind Distance-sampling during the training session. But please, please, PLEASE do not forget to measure and record radial distances for EACH bird recorded on point counts.

4. How: In the "How" column, record **how each bird was detected**, i.e., whether the bird was detected by ear (V=visual, C=calling, S=singing, D=drumming, F=Flyover, or O=other aural, e.g. wing beats). Enter the code for how you **first** detected each individual. Remember that how you detect a bird is different from how you identify it.

When birds sing, this is important information for us to know, as it is a strong indicator that the species is holding a breeding territory (and thus a potentially breeding species in the study area). **If you first detect a bird by means other than it singing and that same individual later sings, neatly write an 'S' in the 'How' box next to the first code entered.**

5. Sex: In the "Sex" column, record the sex of the bird, if known (F=female, M=male, U=unknown). Change a U to an M or F if you later see or otherwise identify the same individual as male or female. Assume that singing birds are males only if: 1) you can see that the singing bird is a male, 2) it is a warbler, or 3) it is singing emphatically and repeatedly. Females of many species will vocalize, although generally their vocalizations are less emphatic and extensive. You should not record sex for birds giving only sex-unspecific calls.

Example 1:
On a point count, you detect six birds. You see a male RNSA, you hear a drumming RNSA, a calling WBNU, a singing WETA, and a singing CHSP, and you see a brown-plumaged CAFI. You should record the radial distances for all six individuals. In order, the "How" column should be filled in with V, D, C, S, S, and V. Fill in the "Sex" column: M, U, U, M, M, and U respectively (male CAFI require two years to achieve adult plumage, thus a brown-plumaged bird cannot be sexed in the field).

6. Bearing: When recording low-density target species on point counts and in between points, use your declination-adjusted compass to site in the direction of the bird and record the true bearing (as opposed to magnetic in WY) to the bird. If you detect a bird at a bearing of 0/360^{o}, please record this bearing as 360^{o} for consistency and to avoid confusion.

7. Transect notes: Enter information relevant to the site or individual points in the notes section at the bottom of the data sheet. It is very important to make notes about rare or unusual birds here. After the field season, RMBO staff review the data and look for any detections that seem odd or out of place. If you positively identify a species that you believe we may question later, it is helpful to write notes to affirm your detection.

This is also the location to record problems encountered during the survey, cool scenery, or other tidbits that either don't really fit in other places or that future surveyors might find interesting. If you are unable to complete a point, record the reason why here.

When entering data into the database, don't forget to look through the notes sections on your data sheets. Notes that are useful to someone surveying next year should be entered on the transect description page.

8. Clusters: "A cluster is a relatively tight aggregation of objects of interest…" (Buckland et al. 2001). In our point count sampling, clusters are actually our unit of observation, with most cluster sizes = 1. There are generally two cases in which cluster sizes are > 1: flocks, and paired birds. In either case, we define a cluster as birds of the same species that you observed TOGETHER (foraging, flying, perching, or obviously interacting with each other). Two males of the same species singing 20 meters apart do NOT constitute a cluster. Distances between members of a cluster should be very short.

How to record clusters:

Flocks: When individuals of the same species are obviously in a flock and cannot be readily sexed (e.g. Cliff Swallow or Pine Siskin), record the distance to the center of the flock and record the number of individuals in the "Cluster Size" column of your data form. You do not need to enter a Cluster Code. When you can determine sex, enter the number of males on one line, and the number of females on the next line, with the appropriate number of each sex in the corresponding "Cluster Size" boxes. Then enter the same letter on both lines for the "Cluster Code" (a, b, c …).

Pairs: Often you may hear a bird singing or calling, look up, and see that it is a male bird with a female perched or foraging nearby. Or you may see one individual moving about, raise your binoculars to identify it, and observe that there are actually two individuals of the same species but opposite sex in that location. In these cases, enter the male and female on separate lines of your data form, with the appropriate codes for "HOW" detected. In the first scenario, the male "HOW" = S(inging) and the female "HOW" = V(isual). In the second scenario, "HOW" = V(isual) for both the male and female. In both cases enter the same letter for the "Cluster Code" of each member of the pair (a, b, c …).

Other aggregations: For sexually monomorphic species, you may observe two birds together but not be able to determine their sexes. If they were detected by the same method (Visual, Singing, Calling, Drumming), they can be entered on the same line of your data form with no "Cluster Code". If you detect them by different methods, enter them on separate lines, with a common "Cluster Code".

Example 2:
After recording a Western Tanager (WETA) and an American Robin (AMRO) on a point count, the observer hears a Black-headed Grosbeak (BHGR) give its distinctive squeaky call note. The observer turns to see the bird and notes that the calling bird is a male BHGR 27 meters away AND also notes that there is a female BHGR in the same tree, but about 29 meters away. Next, the observer hears 5 Pine Siskins (PISI), looks up, and measures that they are 36-38 meters away. Finally, the observer hears a Mountain Chickadee (MOCH) calling, looks up and sees that MOCH as well as a second MOCH in the same tree, both at 17 meters away. The sex of both individuals is unknown, but the method of detection differs,

so record them on separate lines with a common Cluster Code. See table below.

The observer's data looks like this (with a dash indicating no entry):

Point #	Species	Radial Distance	HOW	SEX	CLUSTER SIZE CODE	
03	WETA	46	S	M	1	-
-	AMRO	103	S	M	1	-
-	BHGR	27	C	M	1	a
-	BHGR	29	V	F	1	a
-	PISI	37	V	U	5	-
-	MOCH	17	C	U	1	b
-	MOCH	17	V	U	1	b

9. Squirrels: Yes, squirrels. In an effort to incorporate other products into our bird monitoring programs, we are also collecting data on red squirrels (RESQ) and Abert's squirrels (ABSQ) during point counts. *Treat both squirrels as you would a bird on point counts and treat Abert's squirrels as an "88" species as well.* That is, fill in the How and Sex boxes (generally a "U" for the latter) for each Abert's squirrel detected between points. Please do not forget to record these squirrels **and** their associated data at all point counts, as the utility of these data depend on everyone collecting them throughout the study areas.

10. Flyovers: Flyovers are birds that are not using the habitat in the vicinity of the point count and are only observed traveling high above the area, and not landing within sight. For true flyovers that are not using the surrounding habitat, enter the species code, enter an "F" in the "How" column, and draw a short line through the distance column – i.e. you do not need to estimate distance for flyovers. However, individuals of species that habitually hunt on the wing (e.g. raptors, swallows, swifts) and that appear to be foraging or hunting in the vicinity around the point, should NOT be treated as flyovers, and instead should be recorded as any other bird recorded on the point count. Additionally, individuals that you first detect in flight that are simply flying from perch to perch within the habitat should NOT be recorded as flyovers. Provide distance estimates to these flying individuals where you first detected them and record the best how-detected variable.

11. "99" Birds: While walking between points, record all low-density birds species on the list of "99" birds (see Appendix B). Record the same data you would during a point count (species, distance, how, sex, cluster). Also record the **bearing** to the bird from the line transect**. It is very important to make sure you are on the bearing between points when you record this information.** If you need to leave the bearing in order to avoid an obstacle and detect a 99 bird, note where you detected the bird, return to the between point bearing, and then collect your data.

Don't forget to record the bearing to 99 birds even when you detect them during a point count!

12. VERY IMPORTANT: ***Check over your point-count data <u>before</u> leaving each count station*** to make sure you have recorded all the required information (e.g. distances, how/sex info, etc.). Skip a line between entries for individual points. On the data sheet, you should group together all birds recorded on a particular point; then leave a blank line before starting entries for the next point.

IV. OTHER IMPORTANT REMINDERS

Once you finish your transect and before leaving your sites, don't forget to:

1) **Check to make sure you entered your observer initials, transect#, and sheet #'s at the bottom of EACH page!**
2) **Record the end of transect data (time, temp, sky, wind, transect notes) IMMEDIATELY UPON COMPLETING THE TRANSECT!**
3) **Go through your data sheets <u>carefully</u> to make sure you have not forgotten to record any data. You are not done working until you've reviewed your data from the morning!**
4) **Provide clear and explicit directions to the access point, if you have not already done so!**

APPENDIX B: LOW-DENSITY TARGET SPECIES ("99" BIRDS)

I. Black Hills National Forest

Record radial distance **and bearing** for these species whenever they are encountered anywhere along a transect in ALL HABITATS:

All cuckoos (including GRRO)
All diurnal raptors
All galliforms
All nightjars
All owls
All phoebes
All rosy-finches
All swifts
All woodpeckers (except NOFL and HAWO)
American Dipper
Baltimore Oriole
Bank Swallow
Black-and-white Warbler
Black-billed Magpie
Blue Grosbeak
Bobolink
Brown Creeper
Canyon Wren
Cassin's Finch
Cassin's Kingbird
Cedar Waxwing
Chestnut-collared Longspur
Clark's Nutcracker
Common Yellowthroat
Dickcissel
Evening Grosbeak
Golden-crowned Kinglet
Gray Catbird
Hammond's Flycatcher
Indigo Bunting
Lark Bunting
Lazuli Bunting
Least Flycatcher
Lesser Goldfinch
Loggerhead Shrike
Long-billed Curlew
N. Rough-winged Swallow
Pinyon Jay
Pygmy Nuthatch
Red-eyed Vireo
Say's Phoebe
Turkey Vulture
Upland Sandpiper
Veery
White-throated Swift
White-winged Crossbill
Wilson's Snipe
Yellow-breasted Chat

Report sightings of the following rare species ASAP (within 3-5 days maximum) to: Steven R Hirtzel [shirtzel@fs.fed.us]. Make sure to include the date and location information:

Sharp-shinned Hawk
Cooper's Hawk
Northern Goshawk
Broad-winged Hawk
Flammulated Owl
Yellow-billed Cuckoo
Black-billed Cuckoo
American Dipper (outside of the Spearfish Creek watershed only)
Pygmy Nuthatch

Identifying the locations of rare species is a short benefit of this program that the Forest Service values very much and it can aid in the protection of these species. In your report, please provide UTM coordinates and a description of the location, with general directions to the site. On your GPS unit, log the sightings using the 4-letter code of the species.

II. Arizona (Including Kaibab, Coconino, and Prescott National Forests)

Record radial distance **and bearing** for these species whenever they are encountered anywhere along a transect in ALL HABITATS:

All cuckoos (including GRRO)
All diurnal raptors
All galliforms
All owls
All swifts
All woodpeckers (except NOFL)
Cinnamon Teal
Wild Turkey
Pygmy Nuthatch
Juniper Titmouse
Lucy's Warbler
Yellow-breasted Chat
Abert's Squirrel (Tassel-eared Squirrel)
Red Squirrel

III. Northern Colorado Plateau Network

Record radial distance **and bearing** for these species whenever they are encountered anywhere along a transect in ALL HABITATS:

ALL galliforms
Turkey Vulture
ALL raptors
ALL owls
Common Nighthawk
Common Poorwill
ALL woodpeckers (except NOFL)
Black Phoebe
American Crow
Black-capped Chickadee
Mountain Chickadee
Red-breasted Nuthatch
White-breasted Nuthatch
Western Bluebird
Townsend's Solitaire
Northern Mockingbird
Lucy's Warbler
Yellow-rumped Warbler
Common Yellowthroat
Blue Grosbeak
American Goldfinch

APPENDIX C. GUIDELINES FOR CLASSIFYING STRUCTURAL STAGE BY HABITAT

The following characteristics can generally define the various structural stages of the habitats listed below. Use this information as a guide to help you better understand what we mean by "structural stage". Expect variability among sites depending on geographic location, elevation, aspect, slope, soil quality and other site characteristics. Therefore, you must use your head when judging structural stage. The important thing is to roughly assess the size (structural stage) and density (canopy coverage) of the trees at each point.

You should record all data regarding habitat on page one of the field form *prior to beginning each point count*.

Habitat and Program-Specific Information for Assessing Habitat and Structural Stage:

Aspen

1: Grass-Forb stage: Grasses and forbs dominate; aspen suckers/saplings are absent.
2: Shrub-Seedling stage: Suckers/saplings are present, up to 2 inches dbh and 4 m in height. Stem density can vary from 5,000 to 40,000 stems per acre.
3: Sapling-Pole stage: Saplings between 2 and 8 inches dbh and up to 6-13 m in height on good sites; on poorer sites trees may never reach 8 inches dbh and may be shorter than 6 m, with crooked and twisted boles.
4: Mature stage: On better sites, trees between 16-24 inches dbh and 28-33 m in height. Typically, there is a high density of grass, forbs and shrubs in the understory. Snags are also generally common in this stage.
5: Old-Growth stage: Large diameter trees and many snags are present, as are diseased trees and downed material. Snags often occur in large groups.

High-elevation Riparian

1: Grass-Forb stage: Grasses and forbs dominate; no woody growth occurs.
2: Shrub-Seedling stage: Willows up to 1.3 m in height occur.
3: Sapling-Pole stage: Willows up to 6.6 m in height dominate; alders may also occur. Mortality among willows may be substantial during this stage, resulting in thinning of the stand.
4: Mature stage: Alder and willow co-dominate; blue spruce is also often present.
5: Old-Growth stage: Blue-spruce dominates, along with willows and alders; heavy amounts of litter and downed material, and randomly distributed snags.

Mixed Conifer

1: Grass-Forb stage: Grasses and forbs dominate; no trees or saplings.
2: Shrub-Seedling stage: Saplings up to 1 inch dbh or 3 m in height; stand can be quite dense.
3: Sapling-Pole stage: Dominant trees > 1 inch dbh, but most trees <15 inch dbh; generally only very open stands have significant cone production in this stage.
4: Mature stage: Avg dbh of dominant trees 15 - 25 inches; large dbh snags are relatively sparse.
5: Old-Growth stage: Similar to mature stage but with a greater proportion of large dbh trees; large snags and downfall are more common; forest can be single or multi-layered.

Montane Riparian

1: Grass-Forb stage: Grasses and forbs dominate; no woody growth occurs.
2: Shrub-Seedling stage: Willows up to 1.3 m in height occur.
3: Sapling-Pole stage: Willows up to 6.6 m in height dominate; alders may also occur. Mortality among willows may be substantial during this stage, resulting in thinning of the stand.
4: Mature stage: Alder and willow co-dominate, canopy trees also often present.
5: Old-Growth stage: larger trees common, along with willows and alders; heavy amounts of litter, downed material, and snags.

Pinyon-Juniper

1: Grass-Forb stage: Grasses and forbs dominate; saplings and small trees are absent.
2: Shrub-Seedling stage: Juniper and/or woody shrubs are present; pinyon seedlings are generally absent or sparse.
3: Sapling-Pole stage: Junipers average ~2 m in height; pinyons 2-5 m in height. Few if any snags are present.
4: Mature stage: Wide range of tree sizes may be present; pinyons are generally between 6-18 inches dbh and 3-10 m in height; junipers are typically 6-12 inches dbh and average 6 m in height. Snags 6-20 inches dbh are typically present.
5: Old-Growth stage: Virtually indistinguishable from Mature stage, but incidence of snags, litter and downed material is generally higher.

Ponderosa Pine

1: Grass-Forb stage: Bunchgrasses and bluegrass dominate; pine seedlings absent. This stage usually results from fire and/or logging.
2: Shrub-Seedling stage: Small pine saplings (≤1 inch dbh) and a variety of woody shrubs are likely to be present, as well as grasses. Litter and downed material may also exist.
3: Sapling-Pole stage: Trees 1-7 inches dbh, 3-17 m in height; age of stand 6-50 yrs old. Stands in this stage can be quite dense, normally exceeding 70% canopy closure, and are typically even aged. Some small dbh snags may be present.
4: Mature stage: Avg dbh of trees between 16 to 24 inches. Stand can be multi-layered, and snags suitable in size for most cavity-nesting birds should be present.
5: Old-Growth stage: Avg dbh of dominant trees between 30 to 60 inches; stand uneven in age and generally open; numerous snags of a wide variety of sizes are present.

Spruce-Fir

1: Grass-Forb stage: Primarily herbaceous plants; no trees or saplings; near complete absence of downed litter or snags.
2: Shrub-Seedling stage: Saplings up to 1 inch in diameter at breast height (dbh) are dominant.
3: Sapling-Pole stage: Stems 1-7 inches dbh, and 2-15 m in height are dominant.
4: Mature stage: Avg dbh 16-22 inches.
5: Old-Growth stage: Avg dbh of dominant trees > 22 inches; forest is typically multi-layered, with trees of varying age/size, significant amounts of accumulated downfall and numerous, randomly distributed snags. Grasses and forbs are relatively scarce, but epiphytic vegetation (mosses & lichens) is prevalent.

APPENDIX D. KEY OF TWO-LETTER CODES FOR SHRUBS AND TREES

Code	Shrubs/Small Trees
AL	Alder sp. (*Alnus spp.*)
AB	Alder-leaved buckthorn (*Rhamnus alnifolia*)
AP	American plum (*Prunus americana*)
AC	Arizona Cypress *(Cupressus arizonica)*
BE	Beaked hazelnut
BG	Beargrass (*Nolina spp.*)
BI	Birch spp. (*Betula spp.*)
BB	Blackberry/Raspberry (*Rubus spp.*)
BL	Blackbrush (*Coleogyne ramosissima*)
BF	Buffaloberry (*Sheperdia canadensis*)
BH	Bush honeysuckle (*Lonicera spp.*)
CC	Choke cherry (*Prunus virginiana*)
CH	Cholla (*Opuntia spp.)*
CR	Cliffrose or bitterbrush (*Purshia spp.*)
CJ	Common juniper (*Juniperus communis*) – low growing shrub in high elev. (NOT the tree)
CB	Corkbark Fir
DH	Desert Holly (Berberis fremontii)
DO	Desert Olive *(Forestiera neomexicana)*
EB	Elderberry (*Sambucus spp.*)
FB	Fendlerbush (*Fendlera rupicola*)
GO	Gambel oak (*Quercus gambelii*)
GB	Gooseberry/Currant (*Ribes spp.*)
GW	Greasewood (*Sarcobatus spp*)
HA	Hawthorn (*Crataegus spp.*)
HB	Huckleberry (*Vaccinium spp.*)
IB	Indigo bush or Leadplant (*Amorpha spp.*)
JU	Juniper (bush-size) – all Juniperus species (Utah, Rocky Mountain, and One-seed)
MZ	Manzanita (*Artcostaphalis spp.*)
MT	Mormon Tea (*Ephedra spp.*)
MO	Mountain ash (*Sorbus scopulina*)
MM	Mountain mahogany (*Cercocarpus spp.*)
MS	Mountain/Ocean spray
LC	New Mexico Locust *(Robinia neomexicana)*
NB	Ninebark (*Physocarpus spp*)
OB	Oak bush – not Gambel oak
OG	Oregon grape (*Berberis aquifolium*)
OT	Other shrub – unknown species or not on list
RA	Rabbitbrush (*Chrysothamnus spp.*)
RD	Red-osier dogwood (*Cornus sericea*)
RB	River (water) birch (*Betula occidentalis*)
MA	Rocky mountain maple (*Acer spp.*)
RO	Russian olive (*Elaegnus angustifolia*)
SA	Sage spp. (*Artemisia spp.*)
SL	Saltbush (*Atriplex spp.*)

SB	Serviceberry (*Amelanchier spp.*)
LO	Shrub Live Oak (*Quercus turbinella*)
SC	Shrubby cinquefoil (*Pentaphylloides floribunda*)
SE	Single-leaf Ash (*Fraxinus anoala*)
SK	Skunkbrush (*Rhus trilobata*)
SW	Snakeweed (*Gutierrezia sarothrae*)
SY	Snowberry (*Symphoricarpos spp.*)
TA	Tamarisk/Saltcedar (*Tamarix pentandra*)
TB	Thimbleberry (Rubus *spp.*)
VI	Viburnum (*Viburnum spp.*)
WR	Wild rose (*Rosa spp.*)
WI	Willow spp. (*Salix spp.* - primarily for all shrubby willows)
WO	Wolfberry *(Lycium pallidum)*
YU	Yucca (*Yucca spp.*)

Code	**Large trees**
HH	American hophornbeam (*Ostrya virginiana*)
AH	Ash (*Fraxinus spp.*)
BP	Balsam poplar (*Populus balsamifera*)
BS	Blue spruce (*Picea pungens*)
BX	Box elder (*Acer negundo*)
BR	Bristlecone pine (*Pinus aristata*)
BO	Bur oak (*Quercus macrocarpa*)
BC	**Burned** conifer
BD	**Burned** deciduous
CW	Crack willow (*Salix fragilis*)
DC	**Dead** coniferous - recently dead (still has bark)
DD	**Dead** deciduous - recently dead (still has bark)
DJ	**Dead** Juniper – recently dead (still has bark)
DY	**Dead** pinyon pine – recently dead (still has bark)
DF	Douglas fir (*Psuedotsuga menziesii*)
ES	Engelmann spruce (*Picea engelmannii*)
FC	Fremont cottonwood (*Populus fremontii*)
JU	Juniper spp. (*Juniperus spp.*)
LM	Limber pine (*Pinus flexilis*)
LP	Lodgepole pine (*Pinus contorta*)
NC	Narrow-leaf cottonwood (*Populus angustifolia*)
PB	Paper birch (*Betula papyrifera*)
PW	Peachleaf willow (*Salix amigdaloides*)
PY	Pinyon pine (*Pinus edulis*)
PC	Plains cottonwood (*Populus deltoides*)
PP	Ponderosa pine (*Pinus ponderosa*)
AS	Quaking aspen (*Populus tremuloides*)
RO	Russian olive (*Elaeagnus angustifolia)*
SU	Subalpine fir (*Abies lasiocarpa*)
SN	Unidentifiable snag – no bark
UC	Unknown coniferous tree or not on list

UD	Unknown deciduous tree or not on list
WF	White fir (*Abies concolor*)
WS	White spruce (*Picea glauca*)
WP	Whitebark pine (*Pinus albicaulis*)
WI	Willow species (*Salix* spp.)

APPENDIX E. OPTIMAL DATES FOR CONDUCTING TRANSECTS

I. Black Hills National Forest

Aspen (AS) – 11 June – 6 July
Burn Area (BU) – 28 May – 15 June
Foothills Riparian (FR) – 21 May – 22 June
Late-successional Ponderosa Pine (LS) – 4 June – 6 July
Mixed-grass Prairie (MG) – 21 May – 15 June
Montane Riparian (MR) – 4 June – 29 June
Pinyon-juniper Shrublands (SH) – 21 May – 15 June
Ponderosa Pine, northern hills (PN) – 4 June – 6 July
Ponderosa Pine, southern hills (PS) – 4 June – 6 July
White Spruce (WS) – 11 June – 13 July

II. Northern Colorado Plateau Network

Low-elevation Riparian (LR) – 15 May through 20 June
Pinyon Juniper (PJ) – 15 May through 4 June
Sagebrush Steppe (SA) – 15 May through 15 June

III. Arizona

APPENDIX F. FOUR-LETTER BIRD CODES FOR ALL PROGRAMS

Code	Species	Code	Species	Code	Species	Code	Species
ABSQ	Abert's Squirrel	BCNH	Black-crowned Night-Heron	CHSP	Chipping Sparrow	FOTE	Forster's Tern
ACWO	Acorn Woodpecker	BHGR	Black-headed Grosbeak	CHUK	Chukar	FOSP	Fox Sparrow
AMAV	American Avocet	BTYW	Black-throated Gray Warbler	CITE	Cinnamon Teal	FRGU	Franklin's Gull
AMBI	American Bittern	BTSP	Black-throated Sparrow	CLNU	Clark's Nutcracker	GADW	Gadwall
AMCO	American Coot	BLGR	Blue Grosbeak	CCSP	Clay-colored Sparrow	GAQU	Gambel's Quail
AMCR	American Crow	BLJA	Blue Jay	CLSW	Cliff Swallow	GOEA	Golden Eagle
AMDI	American Dipper	BGGN	Blue-gray Gnatcatcher	COGR	Common Grackle	GCKI	Golden-crowned Kinglet
AMGO	American Goldfinch	BWTE	Blue-winged Teal	COME	Common Merganser	GRWA	Grace's Warbler
AMKE	American Kestrel	BOBO	Bobolink	CONI	Common Nighthawk	GRSP	Grasshopper Sparrow
AMPI	American Pipit	BRBL	Brewer's Blackbird	COPO	Common Poorwill	GRCA	Gray Catbird
AMRE	American Redstart	BRSP	Brewer's Sparrow	CORA	Common Raven	GRFL	Gray Flycatcher
AMRO	American Robin	BTLH	Broad-tailed Hummingbird	COYE	Common Yellowthroat	GRAJ	Gray Jay
ATTW	American Three-toed Woodpecker	BWHA	Broad-winged Hawk	COHA	Cooper's Hawk	GRPA	Gray Partridge
AWPE	American White Pelican	BRCR	Brown Creeper	COFL	Cordilleran Flycatcher	GRVI	Gray Vireo
AMWI	American Wigeon	BRTH	Brown Thrasher	CBTH	Curve-billed Thrasher	GBHE	Great Blue Heron
ATFL	Ash-throated Flycatcher	BCRF	Brown-capped Rosy-Finch	DEJU	Dark-eyed Junco	GCFL	Great Crested Flycatcher
BAIS	Baird's Sparrow	BHCO	Brown-headed Cowbird	GHJU	Dark-eyed Junco (Gray-headed)	GREG	Great Egret
BAEA	Bald Eagle	BUFF	Bufflehead	ORJU	Dark-eyed Junco (Oregon)	GHOW	Great Horned Owl
BAOR	Baltimore Oriole	BUOR	Bullock's Oriole	PSJU	Dark-eyed Junco (Pink-sided)	GRPC	Greater Prairie-Chicken
BTPI	Band-tailed Pigeon	BUOW	Burrowing Owl	WWJU	Dark-eyed Junco (White-winged)	GRRO	Greater Roadrunner
BANS	Bank Swallow	BUSH	Bushtit	DICK	Dickcissel	GRSG	Greater Sage-Grouse
BARS	Barn Swallow	CAGU	California Gull	DCCO	Double-crested Cormorant	GTGR	Great-tailed Grackle
BAGO	Barrow's Goldeneye	CAHU	Calliope Hummingbird	DOWO	Downy Woodpecker	GRHE	Green Heron
BEVI	Bell's Vireo	CAGO	Canada Goose	DUFL	Dusky Flycatcher	GTTO	Green-tailed Towhee
BEKI	Belted Kingfisher	CANV	Canvasback	DUGR	Dusky Grouse	AGWT	Green-winged Teal
BEWR	Bewick's Wren	CANT	Canyon Towhee	EAGR	Eared Grebe	GUSG	Gunnison Sage-Grouse
BLPH	Black Phoebe	CANW	Canyon Wren	EABL	Eastern Bluebird	HAWO	Hairy Woodpecker
BLRA	Black Rail	CAFI	Cassin's Finch	EAKI	Eastern Kingbird	HAFL	Hammond's Flycatcher
BLSW	Black Swift	CAKI	Cassin's Kingbird	EAME	Eastern Meadowlark	HETH	Hermit Thrush
BLTE	Black Tern	CASP	Cassin's Sparrow	EAPH	Eastern Phoebe	HEWA	Hermit Warbler
BAWW	Black-and-white Warbler	CAEG	Cattle Egret	EAWP	Eastern Wood-Pewee	HOLA	Horned Lark
BBWO	Black-backed Woodpecker	CEDW	Cedar Waxwing	EUCD	Eurasian Collared-Dove	HOFI	House Finch
BBMA	Black-billed Magpie	CCLO	Chestnut-collared Longspur	EUST	European Starling	HOSP	House Sparrow
BCCH	Black-capped Chickadee	CSWA	Chestnut-sided Warbler	EVGR	Evening Grosbeak	HOWR	House Wren
BCHU	Black-chinned Hummingbird	CHRA	Chihuahuan Raven	FEHA	Ferruginous Hawk	INBU	Indigo Bunting
BCSP	Black-chinned Sparrow	CHSW	Chimney Swift	FISP	Field Sparrow	ILBH	Indigo x Lazuli Bunting Hybrid
JUTI	Juniper Titmouse	NOPI	Northern Pintail	RBGR	Rose-breasted Grosbeak	VGSW	Violet-green Swallow
KILL	Killdeer	NOPO	Northern Pygmy-Owl	RCKI	Ruby-crowned Kinglet	VIRA	Virginia Rail

Code	Species
LARB	Lark Bunting
LASP	Lark Sparrow
LAZB	Lazuli Bunting
LCSP	Le Conte's Sparrow
LEFL	Least Flycatcher
LEGO	Lesser Goldfinch
LESC	Lesser Scaup
LEYE	Lesser Yellowlegs
LEWO	Lewis's Woodpecker
LISP	Lincoln's Sparrow
LOSH	Loggerhead Shrike
LBCU	Long-billed Curlew
LEOW	Long-eared Owl
LUWA	Lucy's Warbler
MGWA	MacGillivray's Warbler
MAWA	Magnolia Warbler
MALL	Mallard
MAGO	Marbled Godwit
MAWR	Marsh Wren
MCLO	McCown's Longspur
MERL	Merlin
MOBL	Mountain Bluebird
MOCH	Mountain Chickadee
MOUP	Mountain Plover
MODO	Mourning Dove
MIKI	Mississippi Kite
NOBI	NO BIRDS
NOBO	Northern Bobwhite
NOFL	Northern Flicker
FLIN	Northern Flicker (Intergrade)
RSFL	Northern Flicker (Red-shafted)
YSFL	Northern Flicker (Yellow-shafted)
NOGO	Northern Goshawk
NOHA	Northern Harrier
NOMO	Northern Mockingbird

Code	Species
NRWS	Northern Rough-winged Swallow
NSHO	Northern Shoveler
NOWA	Northern Waterthrush
OLWA	Olive Warbler
OSFL	Olive-sided Flycatcher
OCWA	Orange-crowned Warbler
ORIOR	Orchard Oriole
OSPR	Osprey
OVEN	Ovenbird
PESA	Pectoral Sandpiper
PEFA	Peregrine Falcon
PBGR	Pied-billed Grebe
PIGR	Pine Grosbeak
PISI	Pine Siskin
PIJA	Pinyon Jay
PLVI	Plumbeous Vireo
PRFA	Prairie Falcon
PUMA	Purple Martin
PYNU	Pygmy Nuthatch
RECR	Red Crossbill
RESQ	Red Squirrel
RBWO	Red-bellied Woodpecker
RBNU	Red-breasted Nuthatch
REVI	Red-eyed Vireo
REDH	Redhead
RHWO	Red-headed Woodpecker
RNSA	Red-naped Sapsucker
RNPH	Red-necked Phalarope
RTHA	Red-tailed Hawk
RWBL	Red-winged Blackbird
RBGU	Ring-billed Gull
RNDU	Ring-necked Duck
RINP	Ring-necked Pheasant
ROPI	Rock Pigeon
ROWR	Rock Wren

Code	Species
RUDU	Ruddy Duck
RUGR	Ruffed Grouse
RUHU	Rufous Hummingbird
RCSP	Rufous-crowned Sparrow
SAGS	Sage Sparrow
SATH	Sage Thrasher
SACR	Sandhill Crane
SAVS	Savannah Sparrow
SAPH	Say's Phoebe
SCQU	Scaled Quail
SCOR	Scott's Oriole
SEWR	Sedge Wren
SSHA	Sharp-shinned Hawk
STGR	Sharp-tailed Grouse
SEOW	Short-eared Owl
SNEG	Snowy Egret
SOSP	Song Sparrow
SORA	Sora
SPSA	Spotted Sandpiper
SPTO	Spotted Towhee
SPPI	Sprague's Pipit
STJA	Steller's Jay
SWHA	Swainson's Hawk
SWTH	Swainson's Thrush
TEWA	Tennessee Warbler
SWHA	Swainson's Hawk
SWTH	Swainson's Thrush
TEWA	Tennessee Warbler
TOSO	Townsend's Solitaire
TRES	Tree Swallow
TRUS	Trumpeter Swan
TUVU	Turkey Vulture
UPSA	Upland Sandpiper
VEER	Veery
VESP	Vesper Sparrow

Code	Species
VIWA	Virginia's Warbler
WAVI	Warbling Vireo
WEBL	Western Bluebird
WEGR	Western Grebe
WEKI	Western Kingbird
WEME	Western Meadowlark
WESJ	Western Scrub-Jay
WETA	Western Tanager
WEWP	Western Wood-Pewee
WBNU	White-breasted Nuthatch
WCSP	White-crowned Sparrow
MWCS	White-crowned Sparrow (Mountain)
WFIB	White-faced Ibis
WTPT	White-tailed Ptarmigan
WTSW	White-throated Swift
WWCR	White-winged Crossbill
WITU	Wild Turkey
WILL	Willet
WISA	Williamson's Sapsucker
WIFL	Willow Flycatcher
WIPH	Wilson's Phalarope
WISN	Wilson's Snipe
WIWA	Wilson's Warbler
WIWR	Winter Wren
WODU	Wood Duck
YWAR	Yellow Warbler
YBSA	Yellow-bellied Sapsucker
YBCU	Yellow-billed Cuckoo
YHBL	Yellow-headed Blackbird
YRWA	Yellow-rumped Warbler
AUWA	Yellow-rumped Warbler (Audubon's)

Recently Changed Common Names

Tricky Codes

APPENDIX G. SAMPLE TRANSECT DESCRIPTION SHEET

Transect: WY-MC48 Observer Initials: **JST** Date Conducted: **6/29/2008**

Transect Name:

Please verify all Transect Information. If AP, County, Map, etc. is inaccurate please note the correct data!

Map Accurate?
Yes: [X] If no, please describe at bottom of page
No: [ ]

Transect is accessible to: [X] All Vehicle [ ] High Clearance [ ] 4WD only

Roads of Colorado Page: *(if applicable)* DeLorme Page: 59 B5 County: Park State: WY

Access Point UTM: 12 587659 4924771 Management Unit: Shoshone NF

Elevation: Time required to do the transect:

Transect Descriptions

Directions to Access Point:

From Cody, go W on Highway 14-16 towards Yellowstone. 40 miles from the rodeo grounds in Cody you'll pass the Wayfarer's Chapel. Continue another 1.5 miles and look for a gated dirt road on right leading to buildlings. Park here and walk a couple hundred meters to the Mormon Creek bridge. Access point is the concrete bridge abutment on the NE side of the creek.

TransectDescription:

From AP - 148m @ 54 deg to pt. 1.

Pt. 1 - 12 deg to pts. 2-5.
Pt. 5 - 301 deg to pts. 6-9.
Pt. 9 - 211 deg to pts. 10-12.
Pt. 12 - 121 deg to pts. 13-14.
Pt. 14 - 107 deg to pt. 15.
Pt. 7 - Instead of crossing large gully, go above and at 250m go into gully. Point is by tall slender rock on cliff edge. Weather station is visible to W. Use this description if it is helpful, but be sure to follow the given bearing (301 deg) in any case.
Pt. 8 - Travel past weather station down steep, grassy slope into forest.
Pt. 9 - Go upstream to cross drainage
Pt. 10 - Have to go downstream. Point is 50m from west side of stream.
Pt. 12 - USFS cabin is visible at bottom of hill as you approach point.
Pt. 13 - Near cabin/corrals.

Notes:

Point 15 formerly ended up on/near highway, so it was moved in 2005.

Most of the Douglas Firs on this transect are dying.

2007 - I changed 1st bearing from 6o deg to 54 deg, because original bearing would put me in the middle of the of the creek. I could not hear any birds at pt 1 due to loud creek noise.

Camping: I camped @ Eagle Creek campground, ~ 1/2 mile before AP. Hard shell campers only, no tents allowed. You might be able to sleep in your car if you ask the campground host. Otherwise, try camping at any of the other campgrounds along the way.

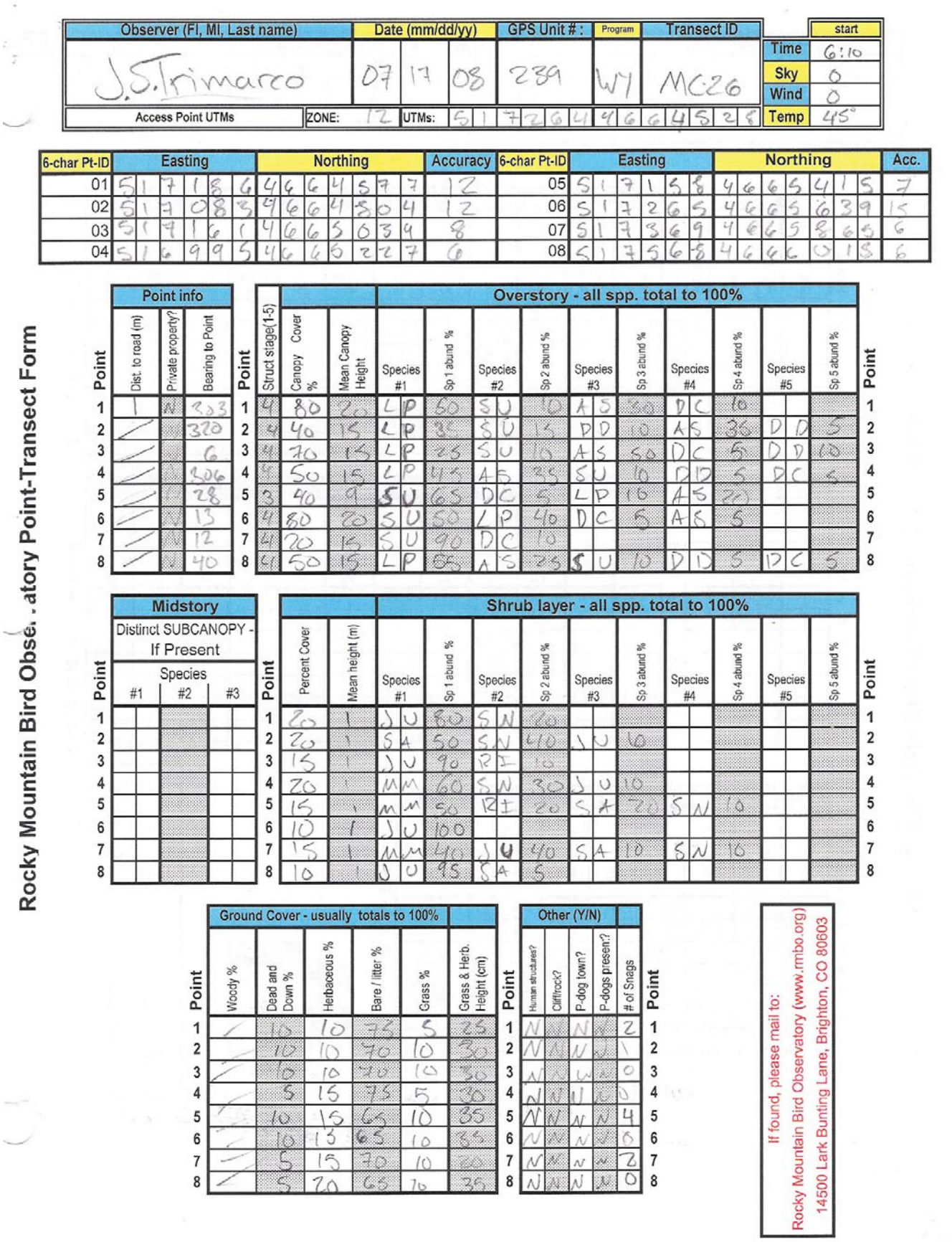
*** Please remember to record bearings for all low density species!**

2008 Notes or Updates and camping information

UTMs:	zone	easting	northing
1:	12	587798	4924818
2:	12	587903	4925045
3:	12	588004	4925272
4:	12	588108	4925500
5:	12	588210	4925727
6:	12	588029	4925900
7:	12	587844	4926078
8:	12	587657	4926248
9:	12	587481	4926423
10:	12	587308	4926243
11:	12	587138	4926060
12:	12	586966	4925878
13:	12	587149	4925712
14:	12	587332	4925541
15:	12	587551	4925420
16:			

APPENDIX H. SAMPLE VEGETATION DATA SHEET

Note: The back side of this datasheet will contain the same form for points 9-15.



Rocky Mountain Bird Obse. .atory Point-Transect Form

Observer (FI, MI, Last name)	Date (mm/dd/yy)	GPS Unit # :	Program	Transect ID		start
J.S.Trimarco	07 17 08	239	WY	MC26	Time	6:10
					Sky	0
					Wind	0
Access Point UTMs	ZONE: 12	UTMs: 513764	466455		Temp	45°

6-char Pt-ID	Easting	Northing	Accuracy	6-char Pt-ID	Easting	Northing	Acc.
01	513764	4664577	12	05	513715	4664615	7
02	513708	4664654	12	06	513726	4664655	15
03	513716	4664653	8	07	513736	4664658	6
04	513699	4664622	6	08	513756	4664601	6

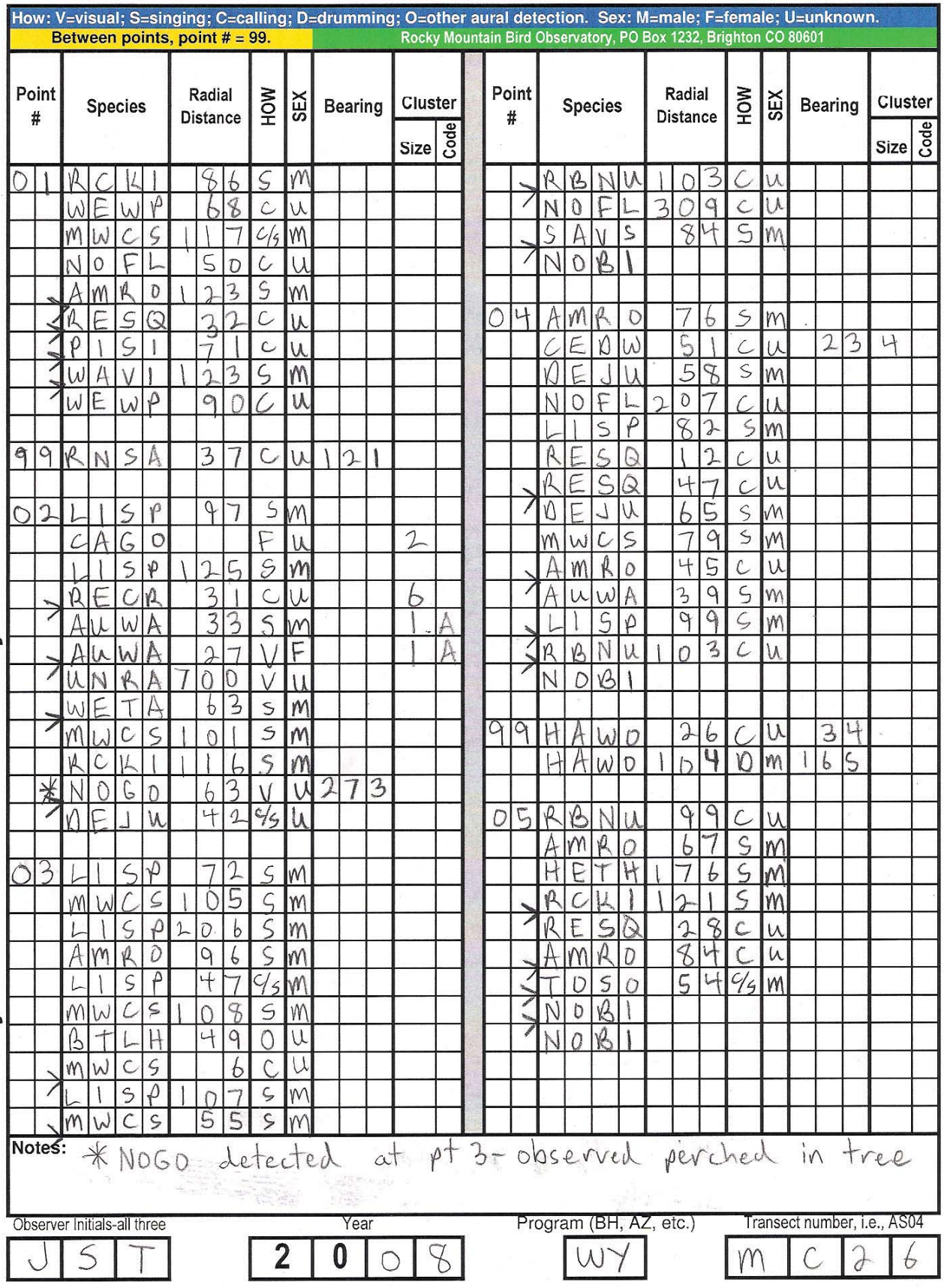
Point	Point info: Dist. to road (m)	Private property?	Bearing to Point	Point	Struct stage(1-5)	Overstory - all spp. total to 100%: Canopy Cover %	Mean Canopy Height	Species #1	Sp 1 abund %	Species #2	Sp 2 abund %	Species #3	Sp 3 abund %	Species #4	Sp 4 abund %	Species #5	Sp 5 abund %	Point
1	1	N	203	1	4	80	20	LP	60	SU	10	AS	30	DC	10			1
2			320	2	4	40	15	LP	35	SU	15	DD	10	AS	35	DD	5	2
3			6	3	4	70	15	LP	25	SU	10	AS	50	DC	5	DD	10	3
4			306	4	5	50	15	LP	45	AS	25	SU	10	DD	5	DC	5	4
5			28	5	3	40	9	SU	65	DC	5	LD	10	AS	20			5
6		N	13	6	4	80	20	SU	50	LP	40	DC	5	AS	5			6
7		N	12	7	4	70	15	SU	90	DC	10							7
8			40	8	4	50	15	LP	65	AS	25	SU	10	DD	5	DC	5	8

Point	Midstory: Distinct SUBCANOPY - If Present, Species #1	#2	#3	Point	Percent Cover	Mean height (m)	Shrub layer - all spp. total to 100%: Species #1	Sp 1 abund %	Species #2	Sp 2 abund %	Species #3	Sp 3 abund %	Species #4	Sp 4 abund %	Species #5	Sp 5 abund %	Point
1				1	20	1	JU	80	SN	20							1
2				2	20	1	SA	50	SN	40	JU	10					2
3				3	15	1	JU	90	RI	10							3
4				4	20	1	MM	60	SN	30	JU	10					4
5				5	15	1	MM	50	RI	20	SA	20	SN	10			5
6				6	10	1	JU	100									6
7				7	15	1	MM	40	JU	40	SA	10	SN	10			7
8				8	10	1	JU	95	SA	5							8

Point	Ground Cover - usually totals to 100%: Woody %	Dead and Down %	Herbaceous %	Bare / litter: %	Grass %	Grass & Herb. Height (cm)	Point	Other (Y/N): Human structures?	Cliff/rock?	P-dog town?	P-dogs present?	# of Snags	Point
1		10	10	75	5	25	1	N		N		2	1
2		10	10	70	10	30	2	N		N		1	2
3		10	10	70	10	30	3	N		N		0	3
4		5	15	75	5	30	4	N		N		0	4
5		10	15	65	10	35	5	N		N		4	5
6		10	15	65	10	35	6	N		N		0	6
7		5	15	70	10	30	7	N		N		2	7
8		5	20	65	10	35	8	N		N		0	8

If found, please mail to:
Rocky Mountain Bird Observatory (www.rmbo.org)
14500 Lark Bunting Lane, Brighton, CO 80603

APPENDIX I. SAMPLE BIRD DATA SHEET



Rocky Mountain Bird Observatory Point Transect Bird Form

How: V=visual; S=singing; C=calling; D=drumming; O=other aural detection. Sex: M=male; F=female; U=unknown.

Between points, point # = 99.

Rocky Mountain Bird Observatory, PO Box 1232, Brighton CO 80601

Point #	Species	Radial Distance	HOW	SEX	Bearing	Cluster Size	Cluster Code
01	RCKI	86	S	m			
	WEWP	68	C	u			
	MWCS	117	C/S	m			
	NOFL	50	C	u			
	AMRO	123	S	m			
→	RESQ	32	C	u			
→	PISI	71	C	u			
→	WAVI	123	S	m			
→	WEWP	90	C	u			
99	RNSA	37	C	u	121		
02	LISP	97	S	m			
	CAGO		F	u		2	
	LISP	125	S	m			
→	RECR	31	C	u		6	
→	AUWA	33	S	m		1	A
→	AUWA	27	V	F		1	A
→	UNRA	700	V	u			
→	WETA	63	S	m			
→	MWCS	101	S	m			
	RCKI	116	S	m			
* →	NOGO	63	V	u	273		
→	NEJU	42	C/S	u			
03	LISP	72	S	m			
	MWCS	105	S	m			
	LISP	206	S	m			
	AMRO	96	S	m			
	LISP	47	C/S	m			
	MWCS	108	S	m			
	BTLH	49	O	u			
→	MWCS	6	C	u			
→	LISP	107	S	m			
→	MWCS	55	S	m			

Point #	Species	Radial Distance	HOW	SEX	Bearing	Cluster Size	Cluster Code
→	RBNU	103	C	u			
→	NOFL	309	C	u			
→	SAVS	84	S	m			
→	NOBI						
04	AMRO	76	S	m			
	CEDW	51	C	u	23	4	
	DEJU	58	S	m			
	NOFL	207	C	u			
	LISP	82	S	m			
	RESQ	12	C	u			
→	RESQ	47	C	u			
→	DEJU	65	S	m			
	MWCS	79	S	m			
→	AMRO	45	C	u			
→	AUWA	39	S	m			
→	LISP	99	S	m			
→	RBNU	103	C	u			
→	NOBI						
99	HAWO	26	C	u	34		
	HAWO	104	O	m	165		
05	RBNU	99	C	u			
	AMRO	67	S	m			
	HETH	176	S	m			
→	RCKI	121	S	m			
→	RESQ	28	C	u			
→	AMRO	84	C	u			
→	TOSO	54	C/S	m			
→	NOBI						
→	NOBI						

Notes: * NOGO detected at pt 3- observed perched in tree

Observer Initials-all three	Year	Program (BH, AZ, etc.)	Transect number, i.e., AS04
JST	2008	WY	MC26