

Field Protocol for Spatially Balanced Sampling of Landbird Populations



Integrated Monitoring in Bird Conservation Regions (IMBCR)

Updated March 2017



Bird Conservancy of the Rockies

Connecting people, birds and land

Mission: Conserving birds and their habitats through science, education and land stewardship

Vision: Native bird populations are sustained in healthy ecosystems

Bird Conservancy of the Rockies conserves birds and their habitats through an integrated approach of science, education, and land stewardship. Our work radiates from the Rockies to the Great Plains, Mexico and beyond. Our mission is advanced through sound science, achieved through empowering people, realized through stewardship, and sustained through partnerships. Together, we are improving native bird populations, the land, and the lives of people.

Core Values:

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.

Goals:

1. Guide conservation action where it is needed most by conducting scientifically rigorous monitoring and research on birds and their habitats within the context of their full annual cycle.
2. Inspire conservation action in people by developing relationships through community outreach and science-based, experiential education programs.
3. Contribute to bird population viability and help sustain working lands by partnering with landowners and managers to enhance wildlife habitat.
4. Promote conservation and inform land management decisions by disseminating scientific knowledge and developing tools and recommendations.

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I. Project Overview

Bird Conservancy of the Rockies in cooperation with the US Forest Service, US Bureau of Land Management, US National Park Service, Colorado Parks and Wildlife, and other agencies, developed a program to monitor bird populations utilizing point counts as the primary sampling technique. The program was designed to be statistically rigorous, biologically accurate, and to produce data for analyses of population trends for most breeding, diurnal landbird species. This document provides details on the design and field implementation of the Integrated Monitoring in Bird Conservation Regions (IMBCR) monitoring program. This protocol is intended to instruct field technicians on how to conduct point counts and to help partners establish monitoring projects of their own, so that the methods can be comparable.

Survey points are arranged in a 4 x 4 grid of 16 points, with 250m spacing between points. Grids are selected using a spatially balanced sampling algorithm (Blakesley and Hanni 2009). Grids are generally selected without regard to habitat type, except for some grids selected partially or fully within riparian corridors. In most instances, grids are stratified by land ownership (National Forests, National Grasslands, National Parks, BLM Field Offices, etc.).

II. Materials

Before heading out into the field, each technician should be sure to have the following equipment (your employer will supply all materials unless otherwise indicated below):

- A. **Timepiece** with a countdown timer and a chime
- B. **Binoculars** (you must provide these)
- C. **Declination-adjustable compass** with sighting capability (e.g., a mirror)
- D. **Clipboard**
- E. **Pencils** (carry at least two with you in the field)
- F. **GPS unit** with point count locations loaded onto it
- G. **Rangefinder**
- H. **Extra batteries**
- I. **Spot Unit or Delorme In-Reach**
- J. **Data forms** sufficient for all the points planned that morning
- K. **Plant ID guide**
- L. **Maps and transect locations**
- M. **Protocol with master list of four-letter bird codes**
- N. **Master list of weather and habitat codes** attached to the clipboard

III. Navigating To the Survey Location

Navigating to randomly selected survey locations can be challenging. Fortunately, there are a number of resources to assist you in finding your way to the most convenient access point for each survey site. You can utilize Bird Conservancy's online transect maps website, view the Google Earth file provided to you by your crew leader, review a previously existing transect description sheet, and/or consult Delorme, BLM, or USFS maps.

A. Bird Conservancy's online maps

Bird Conservancy's online transect description and map website is available at the following link:
<https://fc.rmbo.org/>

You will be required to login using the username and password provided to you at training. Once logged into the site, select the "Transect Description Sheets" link. In the box provided, type in the name of the transect you want to look at (i.e. AZ-BCR34-CF1), make sure just the "Show Maps" box is checked, and hit "Generate Transect Description Sheets". All transect maps meeting the search criteria will be displayed. You can use the zoom and scroll features to follow existing roadways to the most convenient access point. You can also toggle between the terrain, satellite, and maps options. The terrain feature shows topography, which is useful for navigating to the transect and between points. The maps feature only shows roads, but can be valuable when figuring out driving directions to a particular site. The satellite feature will display satellite photo imagery. We recommend that you take a careful look at steep transects using the satellite feature found in the upper left portion of the map. This will give you a better idea of whether steep slopes are vegetated or not. Generally, steep slopes lacking vegetation are not safe for travel.

B. Google Earth files

Prior to training you will receive a Google Earth file with transects that you are expected to complete. To view this KML file you will need to download a free version of Google Earth from the internet (<http://www.google.com/earth/>). Once Google Earth is installed you can double click on the KML file sent to you and view the transect locations. This file will help you plan the order you would like to conduct your assigned surveys to minimize travel time and distance between survey locations. Color-coding the push pin locations of transects by seasonal period may further aid in planning the order surveys should be completed. This can be done by right-clicking on the push pin, selecting "properties", and then changing the style/color for either the label or the icon. Additionally, you can zoom-in to get a better idea of existing roadways and the terrain at the survey locations. We will go over using Google Earth at training.

C. Transect Description Sheet

You will receive a printed transect description sheet (Figure 1) corresponding to each transect that has been assigned to you. If you are missing a transect description sheet you can print one by visiting the transect description site (<http://fc.rmbo.org/>), logging in with your username and password, and entering the full transect name. If you would like to include the landowner information sheet (Figure 2) please check the box next to "show landowner information". Most transect description sheets will already have information recorded on them; however, it is possible that you will be assigned a transect that has not been completed before. Please take the time to record or verify all information on the transect description sheet. This is the best opportunity for information obtained "on the ground" to be passed on to crew leaders and future technicians. Be sure that each of the following fields is filled in before leaving the survey location:

1. Observer Initials

Record your observer ID here.

2. Date Conducted (YYYY/MM/DD)

Record the date you sampled the transect.

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Transect Description Sheet		https://fc.rmbo.org/TransectDescriptionSheets.aspx																																																																																					
Transect: AZ-TONTO-TL10 Transect Name: Deer Creek																																																																																							
Observer Initials: _____ Date Conducted: _____																																																																																							
Please verify all transect information. If the access point, county, map, or other information is inaccurate, please note the correct data!																																																																																							
Transect is accessible to: <input checked="" type="checkbox"/> All Vehicles <input type="checkbox"/> High Clearance <input type="checkbox"/> 4WD Only																																																																																							
DeLorme Page:	County: Gila	State: AZ																																																																																					
Access Point UTM: 12 465906 3766309	Management Unit: Tonto National Forest	Hiking time from AP to grid: 5 hours																																																																																					
Elevation: 3270		Difficulty: 2, 2																																																																																					
Access Point Directions: <p>From the junction of HWY 87 and Bush HWY, drive N on HWY 87 for 35.1 miles. Exit at HWY 180 and go left into the parking lot for the Deer Creek Trailhead. Pt 13 is ~2km away. Follow Deer Creek trail until it goes down to the creek/wash. Cross fence and follow the creek to point 13 (~40 minutes).</p>		Notes: <p>Camping - from trailhead, continue N on HWY 87 for 3.7 miles. Turn right on FR 417 (towards Gisela) and drive 3.2 miles. Turn left onto unmarked road. This turnoff leads back a short way to an OK campsite with some shade. Close to the road, but easily accessible.</p>																																																																																					
Transect Description: <p>PJ and SH habitat. Point 13 is in RI habitat. Lots of ups and downs on this survey, but cattle trails are very helpful.</p>																																																																																							
2012 Notes/Updates/Camping Information <table border="1"> <thead> <tr> <th>Point</th> <th>Zone</th> <th>Easting</th> <th>Northing</th> <th>TRS</th> </tr> </thead> <tbody> <tr><td>1</td><td>12</td><td>465623</td><td>3768688</td><td>T8N R10E 7</td></tr> <tr><td>2</td><td>12</td><td>465373</td><td>3768688</td><td>T8N R10E 7</td></tr> <tr><td>3</td><td>12</td><td>465123</td><td>3768688</td><td>T8N R10E 7</td></tr> <tr><td>4</td><td>12</td><td>464873</td><td>3768688</td><td>T8N R10E 7</td></tr> <tr><td>5</td><td>12</td><td>465623</td><td>3768438</td><td>T8N R10E 7</td></tr> <tr><td>6</td><td>12</td><td>465373</td><td>3768438</td><td>T8N R10E 7</td></tr> <tr><td>7</td><td>12</td><td>465123</td><td>3768438</td><td>T8N R10E 7</td></tr> <tr><td>8</td><td>12</td><td>464873</td><td>3768438</td><td>T8N R10E 7</td></tr> <tr><td>9</td><td>12</td><td>465623</td><td>3768188</td><td>T8N R10E 7</td></tr> <tr><td>10</td><td>12</td><td>465373</td><td>3768188</td><td>T8N R10E 7</td></tr> <tr><td>11</td><td>12</td><td>465123</td><td>3768188</td><td>T8N R10E 7</td></tr> <tr><td>12</td><td>12</td><td>464873</td><td>3768188</td><td>T8N R10E 7</td></tr> <tr><td>13</td><td>12</td><td>465623</td><td>3767938</td><td>T8N R10E 7</td></tr> <tr><td>14</td><td>12</td><td>465373</td><td>3767938</td><td>T8N R10E 7</td></tr> <tr><td>15</td><td>12</td><td>465123</td><td>3767938</td><td>T8N R10E 7</td></tr> <tr><td>16</td><td>12</td><td>464873</td><td>3767938</td><td>T8N R10E 7</td></tr> </tbody> </table>			Point	Zone	Easting	Northing	TRS	1	12	465623	3768688	T8N R10E 7	2	12	465373	3768688	T8N R10E 7	3	12	465123	3768688	T8N R10E 7	4	12	464873	3768688	T8N R10E 7	5	12	465623	3768438	T8N R10E 7	6	12	465373	3768438	T8N R10E 7	7	12	465123	3768438	T8N R10E 7	8	12	464873	3768438	T8N R10E 7	9	12	465623	3768188	T8N R10E 7	10	12	465373	3768188	T8N R10E 7	11	12	465123	3768188	T8N R10E 7	12	12	464873	3768188	T8N R10E 7	13	12	465623	3767938	T8N R10E 7	14	12	465373	3767938	T8N R10E 7	15	12	465123	3767938	T8N R10E 7	16	12	464873	3767938	T8N R10E 7
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Figure 1. Example Transect Description Sheet.

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Name: Jennifer Blakesley Address: 1230 Mountain Vista St., Green River, WY 82935 Phone: (307) 332-0835	(5)(9) (13)
Name: Jeff Birek (owner) Business: Birek Cattle Co. LLC Address: PO Box 247 Green River, WY 82935 Phone: (307) 331-4251 Alternate Phone: (307) 328-4455	1
Name: Green Grass Country Club (Owner), Nick Van Lanen (Contact) Business: Green Grass Country Club Address: PO Box 21 Green River, WY 82935 Phone: Phone: (307) 882-1459 Notes: 2/2011: Contact Nick before entering.	(10)(11) (14)
Name: Chris White (owner) Address: PO Box 844 Green River, WY 82935 Physical Address: 2716 Tulane Dr. Phone: (307) 452-9845	(2)(4)
Name: Jora Rehm-Lorber (owner) Address: 589 Comanche Cir Green River, WY 82935 Phone: (307) 362-3854	(6)(7)(8)
Name: Matthew & Cassidy McLaren (owner) Address: 1100 Mountain Vista St. Green River, WY 82935 Phone: (307) 462-8985	12, 15, 16
Name: David Hanni (owner) Address: PO Box 1441 Green River, WY 82935 Phone: (307) 433-9957	/

Figure 2. Example Landowner Information Sheet.

3. 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 transects to field technicians with appropriate vehicles.

4. DeLorme Page

Don't forget to record the Delorme page and section that the transect is on. This allows future field technicians to quickly locate the transect on the road map.

5. Access Point UTM's

The UTM's and projection zone for the closest spot to the transect where a surveyor can park their vehicle.

6. Access and Transect Difficulty

It is helpful to have an idea of what to expect before surveying 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. It is helpful for surveyors to know if they will be pressed for time to complete all 16 points, so they can ensure that they move quickly between points. Please record the access and transect difficulty using the rubric (Table 1) so future field technicians can plan accordingly.

Table 1. Difficulty Rubric & Code Definitions

Rating Rubric	Transect Difficulty			
Access difficulty	1: Easy	2: Moderate	3: Difficult	4: Inaccessible Terrain
1: Easy	11	12	13	14
2: Moderate	21	22	23	24
3: Difficult	31	32	33	34
4: Inaccessible Terrain	4	4	4	4

Explanation of codes

Access Difficulty (Measure of the hiking difficulty from the access point to the transect):

- 1: ≤ 3 km and easy topography. Hike to transect requires less than 45 minutes.
- 2: 3 km - 6 km with relatively easy topography. Hike to transect requires less than 75 minutes.
- 3: ≥ 6 km and/or difficult terrain. Transect likely requires backpacking into transect the day before.
- 4: Transect is inaccessible due to river, cliffs, or other dangerous terrain.

Transect Difficulty (Measure of the difficulty traveling between points on a transect):

- 1: Relatively flat transect. 16 points are easily surveyed in approximately 4 hours.
- 2: Hilly terrain, areas with dense vegetation, and/or a few stream crossings. Technician might not be able to complete all 16 points during the sampling period.
- 3: Steep slopes, dense vegetation, or difficult stream crossings throughout the transect. Technician is unlikely to complete 12 or more points during the sampling period.
- 4: Transect has cliffs, rivers, or other dangerous terrain that do not permit 6 points to be finished.

7. Directions to Access Point (VERY IMPORTANT!)

You will want to 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 location for these directions. When recording directions to the Access Point; provide explicit directions from a major intersection within a nearby town readily found on a map to the Access Point. It is extremely helpful to provide mileages from intersections or other landmarks using your odometer. For all sites, take GPS readings and record the **UTM coordinates** for each Access Point. It can be helpful to make the Access Point a recognizable feature on the landscape, like a cattle guard or sign post. You may encounter a situation where a road has been gated, washed out, etc. In these instances it is very important to record appropriate changes to the existing directions. Please help future surveyors by making these important changes regarding transects access.

If necessary, provide the distance and time to hike from the Access Point to the grid, or more specifically, to the first point if it becomes apparent that there is a logical order in which to survey the points. Record recommendations of a survey route through the grid for the subsequent year, if necessary. As some of these grids are miles from the nearest road, explicit details of a good route to the transect will help future technicians immensely.

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

DO NOT FORGET TO RECORD THE UTM'S OF THE ACCESS POINT ON THE TOP OF THE SHEET!

8. Transect description

In this section, please record the primary habitat types encountered on the transect. When necessary, please provide directions between points, describing paths future technicians may want to follow. You can also include useful information about terrain, barbed wire fences encountered, and any other information that would be helpful to know when surveying a transect.

9. Notes, Updates, and Camping Information

Please provide directions and a description of camping options in the area in this section. Sometimes, camping is available right at the Access Point. If not, then record directions 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 (e.g., the transect is surrounded by private land) then record where you stayed. The nearest library or free internet location is often helpful information as well. Also, you can enter information relevant to the site, problems encountered during the survey, cool scenery, or other tidbits that either don't fit in other places or that future surveyors might find interesting. Please refrain from listing bird species that were found on the transect as this can bias future detection data.

D. Delorme, BLM, and USFS Maps

Delorme maps are a particularly useful tool for driving around whatever study area you are working in. Surveys on BLM lands or National Forests may be greatly aided by maps produced by those agencies. In particular, we recommend having a USFS map for backcountry surveys as these will display trail systems and parking areas and can greatly simplify navigation to the transect. In most cases, your employer will provide you with these maps. If you do not have a map that you feel is necessary, contact your supervisor to see if you can be reimbursed for the expense of a purchased map.

IV. Verifying Access Permission

Land ownership is determined by the Landowner Liaison prior to the beginning of the field season. Technicians are responsible for determining public or granted access routes to the survey location. Do not attempt to cross or survey property if you have any question regarding ownership. Trespassing is a serious offense and may be cause for immediate termination. The following descriptions explain the most common types of landownership encountered while conducting bird surveys:

- Public Right-of-Way: Public right-of-ways are federal, state or local governmental passageways through any type of land ownership. The most common form of a public right of way is a road. **This does not mean that all roads are public.** Interstates, state highways, county, USFS and BLM roads are public right of ways. Therefore, if a road is labeled as such, you can travel on the road without trespassing. Legally, landowners cannot gate public right of ways even if they own adjacent property; however, you may see instances where this occurs. If you come to a gate or other indicator (e.g. No Trespassing sign), assume you have reached the end of the public right-of-way.
- Federal Lands: USFS and BLM lands are generally accessible to the public without the need for permits or passes. However, local restrictions may apply (i.e. due to safety precautions or sensitive wildlife areas) – you can check on closures by contacting the district or field offices. U.S. Fish and Wildlife Service, Department of Defense and U.S. National Park Service lands are more restricted and typically require passes and/or permits. Bureau of Indian Affairs lands are treated as Private Lands and may require a letter granting permission.
- State Lands: Generally, there are two major types of state lands; state trust lands and state resource (i.e. wildlife, parks, or forest) lands. Each state has varying regulations outlining how lands are used and accessed. For example, in Colorado you must have permission from the Colorado State Land Board before accessing state lands, whereas in North Dakota, the public may access school trust lands without prior consent. State resource lands almost always require passes or permits. Be sure to ask your field crew leader about the regulations for your study area.

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- Local Government Lands: The most commonly encountered local government lands are county and city lands. Because local government policy varies significantly between entities, be sure to check with your field crew leader to determine if passes and/or permits are required.
- Private Lands: Private lands are owned by individuals or businesses. Private landowners have the right to prevent access to the land they own. Furthermore, they have the right to prevent access to adjacent public land if no public right of way exists. Trespassing laws vary state to state; for simplicity's sake, if you are on private land without landowner consent – you are trespassing.

Additional Factors:

If passes or permits are required, Crew Leaders will obtain permits before the transect is surveyed. Your employer will reimburse you for any pass fees incurred while conducting surveys.

You may find yourself working in an area where there is a mixture of public and private parcels in a configuration resembling a checkerboard. This is most commonly found in BLM lands; however, may also occur in other areas. In these instances, it is not legal to "jump corners" from one public parcel to the next. For instance, in the figure below, it would not be legal to pass from parcel one to parcel four without permission from the landowner of parcel two or three.

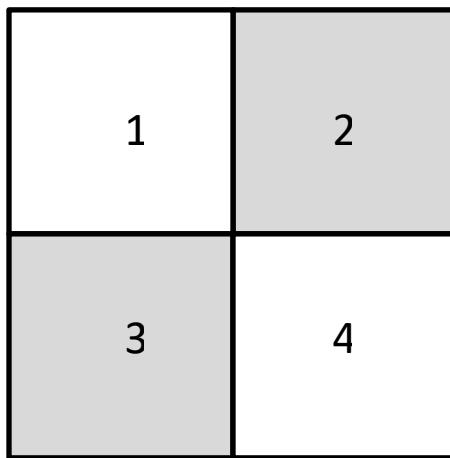


Figure 3. Representation of "checkerboard" landscape. Shaded squares represent private parcels and un-shaded squares represent public parcels.

Determining and Recording Access Permission

It is your supervisor's goal to obtain permission to access private or restricted property prior to the beginning of the field season. Under most circumstances permission to survey at least 4 of the 16 point count locations (the minimum required for a transect to be considered "complete" due to private land issues) on a transect will have already been obtained before the transect is assigned to you. On occasion, technicians may be asked to contact assessor offices, resource managers, and/or private landowners to obtain additional contact information and permission. **It is each technician's responsibility to verify which points your employer has obtained permission to survey prior to navigating to the survey site.** Please go to: <http://fc.rmbo.org> and click on the link for the landowner database.

Once you log in using the username and password provided to you at training, you can navigate to the appropriate transect and review the access status for each point. Please make sure to circle each point where access has been "granted" and cross out any points where access has been "denied" on your landowner information sheet (Figure 2). Points where the access status is listed as "no contact" or "unknown" should not be marked. This will help you understand and remember which points are ready to survey, which points should be avoided, and which points could use some more information in the event that you encounter a landowner near the transect or see a nearby house. Technicians are responsible for reviewing the notes associated with each landowner whose land they intend to survey to make certain there are no instructions regarding driving on roads, disturbing cattle, etc. Please record these

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notes on your landowner information sheet as a reminder to yourself.

Finally, **technicians are responsible for calling landowners that have granted access to their property two or three days prior to surveying the property**. It is extremely important that technicians do this because your employer has promised each landowner that they will receive notification prior to the survey, as a courtesy to them. When calling please tell the landowner your name, the organization you are working for, provide an expected date that you will be on their property, and describe the vehicle that you will be driving. In the event that a landowner who has already granted permission doesn't answer the phone, a voicemail message will suffice. If the landowner doesn't answer and you are unable to leave a message you should not survey the property until you establish some contact with the landowner. If you are unable to establish contact after four attempts please contact your crew leader. If your employer obtained permission via mail, but, there is no associated contact phone number, it is okay to survey those points without talking to the landowner, as long as the technician has the return card granting permission with them at the time of the survey.

Please record notes on all your attempts to contact landowners and the result of those attempts on the "contact log" datasheet on the back of the landowner information sheet (Figure 4). You will use this form to record any additional landowner information you may collect in the field. If you find that the landowner information we provided is different from what you encounter in the field (such as landowner names, phone numbers, addresses, etc.) or, if you obtain new landowner information, please record that information on the appropriate line. Also, if a point is listed as private, and you discover it is actually public (or vice versa), you will record that information here as well. Be sure to record all information on this sheet in the landowner database (see data entry protocol).

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Transect Description Sheet

<https://intranet/TransectDescriptionSheets.aspx>

Landowner Contact Log for WY-BCR10

Date contacted	Landowner name	Contact type	Resulting access status	Attempt #	Need to call again?
5/20	Jeff Birck	Courtesy	—	1	YES
Notes:	no answer/not able to leave a message.				
5/22	Jeff Birck	Courtesy	—	2	YES
Notes:	no answer/not able to leave a message				
5/24	Jeff Birck	Courtesy	granted	3	NO
Notes:	Spoke to Jeff and confirmed 5/27 Survey date				
5/24	Jennifer Blakesley	Courtesy	granted	1	NO
Notes:	Left a message on machine indicating I would be surveying 5/27 - Left my # for her to call back				
5/24	Green Grass / Nick	Courtesy	granted	1	NO
Notes:	Spoke to Nick and confirmed 5/27 Survey date				
5/24	Chris White	Courtesy	granted	1	NO
Notes:	Left message with receptionist indicating I would be surveying 5/27 - Asked to have Chris call back if he had questions				
5/24	Jora Rehm-Lorber	Courtesy	—	1	YES
Notes:	Spoke to Jora who confirmed permission, but asked me to call Ranch manager (Doug) at 307-362-3855				
5/25	Jora / Doug	Courtesy	granted	2	NO
Notes:	Spoke to Doug and confirmed 5/27 Survey Date				
Notes:					
Notes:					

Figure 4. Example Landowner Contact Log

V. Preparation

A. Stay Organized

Organize equipment and materials for the following morning's survey. Prepare food and personal gear to facilitate a timely departure from camp or the trailhead. Bring appropriate gear, including extra water and a first aid kit every day. Before heading out into the field, be sure to have all the gear and equipment necessary to complete your survey.

B. Familiarize yourself with the survey site

The day before conducting a point count survey, familiarize yourself with the survey area and habitat. You should plan an access route during the daylight. This will make it easier to navigate to the first point if you have to hike in in the dark the next morning. Determine the point to point route you will take to conduct the survey. If the survey is in a remote area, be sure to make arrangements to camp the previous night near the survey area.

C. Check Weather Reports

Unless there are extreme conditions predicted for the morning (e.g., strong winds and/or heavy rain), we recommend that observers attempt to conduct a survey. Counts should not be conducted if wind strength on the Beaufort scale is a sustained 5 or greater, or if it is raining (anything greater than a drizzle). If you encounter these conditions, wait until the weather improves or, cancel the sampling for that day and try again on another day. If you are unable to conduct a survey because of bad weather, you will be required to complete other work that day, such as data entry, landowner calls, etc. Refer to the "2015_Requirements_For_Reimbursements_Timesheets_Data" document provided in your field binder for more information on this.

D. Daily Timing

Sampling will occur in the morning, beginning approximately $\frac{1}{2}$ hour before sunrise (once there is enough light to identify birds by sight) and ending no later than 5 hours after official sunrise. There is considerable variation among sunrise times, and it is advisable to use a table localized for the area being sampled (many GPS devices display the local sunrise time based on your location as well). Attempt to arrive at the first point while it is still dark so that the count can begin as soon as it is light enough to see. Singing rates for most species are usually highest before or near official sunrise and then decline slowly over the next few hours.

E. Safety

Please review the IMBCR Field Safety Manual provided to you before conducting your first survey. It is important to make sure: 1) you are aware of the dangers you may encounter in the field, 2) you know how to minimize the likelihood of encountering those dangers, and 3) you know what to do in the event you encounter a dangerous situation.

As an added safety measure for Bird Conservancy field technicians, SPOT (Satellite Personal Tracker) or InReach units are provided for each individual. SPOT and InReach units are a way for technicians to regularly check in with their field crew leaders to maintain contact when both parties have irregular access to internet and phone service. Additionally, they allow technicians to send a "help" message in the event of an emergency. Bird Conservancy requires field technicians to send their crew leader an "ok" message prior to, and following, the completion of each survey. This assures the field crew leader that technicians are able to safely get into, and out of, their transects on a daily basis. The nature of this form of contact requires the regular and consistent use of the units; otherwise, the field crew leader is left wondering if the technician forgot to check in, or, if they are in need of assistance. The use of SPOT and InReach units will be covered in detail during training, and more information is available in the Safety Protocol.

VI. Conducting Point Count Surveys

A. Seasonal Timing

Point counts should be performed after all migratory species have returned to their breeding areas and as early in the season as possible without counting transient birds that are still migrating through. Counts performed in grasslands in late May are not comparable to counts performed in the same habitat in early July. Most local breeding birds complete nesting before the middle of July and are much less vocal at that time compared to earlier in the breeding season. Below is a list of the optimal survey dates for each study area.

Arizona:

<3,500ft (<1,000m) – April 20th – May 10th
3,500ft – 5,000ft (1,000m – 1,500m) – May 1st – May 20th
5,100ft – 6,500ft (1,500m – 2,000m) – May 10th – June 10th
6,600ft – 7,500ft (2,000m – 2,300m) – May 20th – June 20th
>7,500ft (>2,300m) – June 10th – July 5th

Colorado:

<6,500ft (<1,981m) – May 10th – June 10th
6,500ft – 8,000ft (1,981m – 2,438m) – June 1st – June 25th
8,000ft – 9,300ft (2,438m – 2,834m) – June 10th – July 10th
>9,300ft (>2,835m) – July 1st – July 15th

Idaho/Montana:

<7,500ft (<2,300m) – 25 May – 15 June
7,500ft – 9,300ft (2,286m – 2,835m) – 5 June – 30 June
>9,300ft (>2,835m) – 1 July – 15 July

Kansas (entire state):

May 1 – June 15

Nebraska and South Dakota:

<3,000ft (<900m) - 20 May - 15 June
3,000ft - 5,000ft (900m - 1,500m) - 1 June - 26 June
>5,000ft (>1,500m) - 27 June - 10 July

New Mexico (entire state):

April 15 – May 31

North Dakota (entire state):

June 1 - June 26

Oklahoma (entire state):

April 20 – June 15

Texas (entire state):

April 20 – June 15

Utah

<6,500ft (<1,981m) – May 10th – June 10th
6,500ft – 8,000ft (1,981m – 2,438m) – June 1st – June 25th
8,000ft – 9,300ft (2,438m – 2,834m) – June 10th – July 10th

>9,300ft (>2,835m) – July 1st – July 15th

Wyoming/Caribou-Targhee National Forest:

<6,500ft (< 2000m) – 20 May – 20 June

6,500ft – 7,500ft (2,000m – 2,300m) – June 5th – July 1st

7,500ft – 8,500 (2,300m – 2,600m) – June 15th – July 10th

8,500ft (>2,600m) – July 1st – July 20th

B. Point Counts – Getting Started

You will receive a GPS unit with all of the point locations for your transects loaded onto it. Follow the GPS unit to each point count station (we will practice this during training). Please see Appendix A for a description of how points are labeled within the GPS unit. 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** (however, do identify and make a note on your datasheet of the locations of any birds flushed from around the count station upon your approach). Filling out the habitat data 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” after the disturbance you created while approaching the point.

C. Approaching the Point

There may be instances where you should not or cannot conduct the survey from the exact point location. In these instances, observers may conduct a point count from anywhere within a 25m radius of the exact point count location. Common reasons why an observer might survey up to 25m from a point count station include: 1) permission was not granted from a private landowner; however, the observer can count from a public right-of-way road that is within 25m 2) the point count station does not afford good visibility (a boulder, rock or other obstruction is blocking your view, or it is down in a wash) or 3) it is difficult to hear (often times running water can make hearing birds difficult but moving a few steps away greatly improves your aural detection ability). You should make every effort to conduct the count from the exact point location and only survey up to 25m from a point if it is absolutely necessary. If you are unable to get within 25m of the exact point location, most likely because of a physical barrier, then do not survey the point.

D. Collecting Habitat Data

Fill in the habitat data for each point surveyed while at the point. Unlike the bird data, which we record to an unlimited distance from each point, **we only record habitat data within a 50m radius of each point**. We use the habitat data to relate bird density to vegetation features and habitat types. This information will have real applications for managing habitats for birds, so please be as accurate as possible with these data. Because it is very important to finish as many point counts as possible in a morning, we ask that you do not spend more than a couple minutes filling in habitat data at each point. Collect samples of unknown plant species (place in a numbered zip lock bag) so you can identify them after completing the survey. Below is a description of the fields found on the vegetation datasheet and brief instructions on recording these data. Please refer to Figure 5 at the end of this section for an example of a completed vegetation datasheet.

1. Site Data

- a. **Observer:** Enter the unique login that was provided to you
- b. **Date:** Enter the date using the following format: YYYY-MM-DD
- c. **GPS Unit #:** If your unit has a silver property tag on the back of it; please enter that number here. If your GPS unit does not have a silver property tag please enter “0000” in this field.
- d. **Transect ID:** Enter the full character code identifying the state, stratum and transect number (e.g., CO-BCR16-AR8) as it appears on the transect description page. It is important to fill out the FULL name of the transect.
- e. **Access Point:** Mark the access point using your GPS unit and record the zone and coordinates on the datasheet. If a transect is located far from any road it is still useful to record UTMs of a logical place to leave your vehicle.

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- f. **Time:** (start and end) Enter start and stop times in military time for the entire transect using **Mountain Daylight Time**. Record the start time when you arrive at your first point and begin recording site data. Record the stop time once you've completed your final point count for the morning.
- g. **Sky:** (start and end) Enter one-digit codes at beginning and end of the point count grid survey (not for each point)

0=0-15% cloud cover 1=16-50% cloud cover 2=51-75% cloud cover
3=76-100% cloud cover 5=fog 6=drizzle
8=Light snow

You should not survey in any other conditions!

- h. **Wind:** (start and end): Enter one-digit codes at beginning and end of the point count grid:

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 should not survey in any other conditions!

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

2. Point Info

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

3. Other (Y/N)

- a. **Midstory Present:** Record either Y or N to indicate the presence of several distinct layers of overstory vegetation.
- b. **Cliff/rock:** Record either Y or N to indicate the presence of cliffs or large rocky outcrops within a **50m** radius of the count station
- c. **Prairie dog town (P-dog town?):** Record either Y or N to indicate the presence of a prairie dog town. Abandoned towns should be marked as Y.
- d. **Prairie dog present (P-dogs present?):** 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. **Cheatgrass Present:** Record either Y or N to indicate the presence of cheatgrass. Record Y if there is growth from the current year and/or if there is growth from the previous season.

4. Primary Habitat

Enter a two-letter code corresponding to the primary habitat type that best describes the 50m radius surrounding the point. Please use the descriptions below as a guide:

- a. **Agricultural /Rural (AR):** vegetation has been planted by humans for food production or ornamental purposes in sparsely developed areas. Examples include a farmed field with wheat, corn, millet, etc., a fallow field, a rural home site with planted non-native species, or a park planted with non-native species. Please make note of crop spp., if fallow, etc.

- b. **Aspen (AS):** overstory dominated by aspen although scattered ponderosa pine or Douglas-fir may be present. The overstory cover should be $\geq 10\%$ and consist of $\geq 50\%$ aspen. Aspen stands often have an abundant and diverse shrub layer. Typical shrub species in aspen habitats include snowberry, willow, sagebrush, mountain mahogany, and oak. On occasion there may be no shrub layer. Typically the ground under aspen stands is covered by grasses and forbs.
- c. **Alpine Tundra (AT):** high-elevation, open landscapes that occur above tree line. These areas should have $\leq 5\%$ overstory and often lack a significant shrub component. Ground cover consists of short grasses (generally $\leq 10\text{cm}$ in height), wild flowers, mosses, lichens, and succulents.
- d. **Burned Area (BU):** forest habitat where $\geq 50\%$ of canopy is dead and shows evidence of severe fire scars or where $\geq 50\%$ of trees have burned and fallen.
- e. **Cliff/Rock (CR):** area is dominated by rock and/or generally lacking vegetative cover (e.g., talus slopes, boulder fields, and rocky outcroppings). Areas described as Cliff/Rock should have $\leq 10\%$ shrub cover and $<10\%$ canopy cover. Bare rock should make up $\geq 20\%$ of the exposed ground cover.
- f. **Desert/Semi desert Shrubland (DS):** dry landscape containing shrubs, but lacking a co-dominant grass component. % shrub cover should be ≥ 10 . Shrubs often include sagebrush, greasewood, Fremont mahonia and saltbush. Sagebrush must comprise $\leq 30\%$ of the shrub composition (see Sage Shrubland). Ground cover layer is typically dominated by bare ground and rock with limited forbs and grasses present. Grass and forbs make up $\leq 20\%$ of ground cover (see Shrubland).
- g. **Deciduous Woodland (DW):** habitat consisting of $\geq 10\%$ canopy cover that is dominated by deciduous species other than Aspen or Oak species. Native deciduous species should comprise $\geq 50\%$ of the canopy cover and Aspen or Oak spp. must comprise $\leq 50\%$ of the canopy cover. The 50m radius should not include a permanent or seasonal water source (see Riparian).
- h. **Grassland (GR):** landscape lacking an overstory and significant shrub component. Ground cover is dominated by grasses and perhaps some forbs. Shrub component must be $<10\%$ (see Shrubland). The sum of live and dead standing grass must be $\geq 10\%$.
- i. **Historic Wetland (HW):** land that was historically considered to be a wetland, but has since dried up. Wetland vegetation still dominates the landscape, although it is probably dried up and dead.
- j. **Insect Infested (II):** forested habitat with $\geq 10\%$ of the overstory composition dead or sickly - typically referring to pine and spruce bark beetles affecting several species of pine and spruce trees. Canopy cover **must be $\geq 10\%$** .
- k. **Larch (LA):** overstory dominated by larch although other coniferous and deciduous species may be present. The overstory cover should be $\geq 10\%$ and consist of $\geq 50\%$ larch.
- l. **Logged (LO):** area within a forested habitat that has been recently logged. Overstory cover should be $\leq 10\%$ (see a variety of forest primary habitats). Shrub cover should be $\leq 10\%$ (see Shrubland). There should be little to no regrowth of shrub and/or overstory species. Ground cover typically consists primarily of grasses, stumps and dead and down timber.
- m. **Lodgepole Pine (LP):** habitat consisting of $\geq 10\%$ canopy cover that is dominated by lodgepole pine. Canopy may have other conifer species or some aspen, but lodgepole pine must comprise $\geq 50\%$ of the overstory cover. Shrub layer can be conspicuous or nearly absent.
- n. **Mesquite Bosque (MB):** forested habitat surrounding riparian corridors that consists of $\geq 50\%$ mesquite species. Canopy cover should be $\geq 10\%$. Ground cover typically consists primarily of grasses.
- o. **Mixed Conifer (MC):** forested habitat consisting of several species of conifers, such as ponderosa pine, lodgepole pine, Douglas-fir, or spruce/fir spp. If the area is dominated by Douglas-fir, use Mixed Conifer as the primary habitat type. Canopy cover should be $\geq 10\%$. Overstory may range from very dense to relatively open. Undergrowth is complex and typically contains deciduous shrubs and/or conifer saplings. Stands with dense overstory may have little or no shrub and ground cover.
- p. **Montane Meadow (MM):** areas with little to no overstory that are surrounded by forests. Elevations should be $\geq 7,000'$. Soils should be moist to wet with forbs or grass as the dominant ground cover. Canopy cover should be $\leq 10\%$. Shrub layer should be $\leq 10\%$.
- q. **Oak Woodland (OA):** Habitat dominated by oaks (*Quercus* spp.), often accompanied by juniper, ponderosa pine, pinyon pine, or Chihuahuan Pine. The overstory and shrub cover must sum to $\geq 10\%$

- cover, with oak species making up $\geq 50\%$ of that cover. In some instances there may be little or no overstory because the Oak species that are present are $< 3\text{m}$ high. In southern Arizona this habitat code should be used for Madrean woodlands.
- r. **Open Water (OW):** habitat consisting of $\geq 50\%$ open water, bank, and shoreline. Any other habitat type may be present, but must be $< 50\%$.
 - s. **Pinyon-Juniper/Juniper (PJ):** vegetative communities largely influenced by pinyon pine, juniper, or a combination of the two species. The overstory and shrub cover must sum to $\geq 10\%$. Semi-arid conditions often produce a relatively short overstory. Juniper tends to dominate at lower elevations while pinyon dominates at higher elevations. Typically, shrub layer includes sagebrush, rabbit brush, oak, or mahogany. Ground cover is usually dominated by grasses with fewer forbs. In some instances there may be little or no overstory because the PJ that is present is $< 3\text{m}$ high.
 - t. **Playa (PL):** Shallow, ephemeral wetland that experiences significant seasonal changes in semi-arid to arid climates, including the Great Plains. They are primarily filled by rainfall, although playas found in agricultural settings may also receive water from irrigation runoff. They often have high salinity or may be completely dry. Some wetland-loving plants like sedges or rushes may be present even when surface water is not present.
 - u. **Ponderosa Pine (PP):** areas with $\geq 5\%$ overstory cover that is made up primarily of ponderosa pine. This habitat often includes other tree types such as fir, pine, and aspen, but ponderosa pine should comprise $\geq 50\%$ of the overstory layer. Shrub layer relatively open and often includes common juniper, oak, cliffrose, and currants. Ground cover typically dominated by grass species. This code should be used even if there is a significant oak understory.
 - v. **Riparian (RI):** stands or strips of trees or shrubs near a permanent or seasonal water source. Typical tree and shrub species include cottonwood, box elder, maple, aspen, alder, and willows. Riparian areas are typically discrete habitats, often surrounded by coniferous forest, grassland, shrubland or sagebrush habitat. If riparian habitat is present within the 50m radius, this should be the primary habitat type.
 - w. **Sage Shrubland (SA):** habitat where grasses and shrubs are co-dominant and the shrub cover is $\geq 10\%$. Shrub species must consist of $\geq 30\%$ sagebrush. Typical ground cover is dominated by grasses with limited forbs and bare ground.
 - x. **Spruce-Fir (SF):** coniferous forest that is dominated by spruce and fir species (typically occurring at elevations $\geq 7000'$). Note that Douglas-fir is not a true fir species (see Mixed Conifer). Overstory cover should be $\geq 10\%$ with spruce and fir species comprising $\geq 50\%$ of the overstory cover. Variable understory typically includes shrubs and forbs with few grasses.
 - y. **Shrubland (SH):** landscape co-dominated by grass and shrub species. Shrub cover must be $\geq 10\%$. Sagebrush must be $< 30\%$ of shrub layer (see Sage Shrubland). Typical shrub species include ceonothus, manzanita, sage, rabbitbrush, currant, skunkbrush, serviceberry, and plum. Grass and forbs should make up $\geq 20\%$ of ground cover (see Desert/Semi desert Shrubland).
 - z. **Urban/Residential (UR):** areas highly impacted by human development in which $\geq 20\%$ of the ground is covered by impermeable surfaces. Typically describing relatively dense development including houses, lawns, sidewalks, parking areas, and streets.
 - aa. **Western Cedar (WC):** habitat consisting of $\geq 10\%$ canopy cover that is dominated by western cedar species including western redcedar, incense cedar, and Alaska cedar. Canopy may have other conifer or deciduous species, but cedar species must comprise $\geq 50\%$ of the overstory cover.
 - bb. **Wetland (WE):** habitat influenced by permanent or seasonal flooding resulting in tall reeds, grasses, and/or cattails with little to no overstory. This habitat is defined by the presence of some emergent vegetation that is adapted to wet soils or inundation. Typical species include cattails, sedges, rushes, and sphagnum mosses. Overstories are limited to drier areas around the wetland and overstory cover should be $\leq 10\%$.
 - cc. **Not Listed (XX):** primary habitat type does not fall into any of the above categories. This code is generally used when working in a new study area that has habitat types not encountered previously on

IMBCR surveys. Make sure you write notes in the margin on the right of the datasheet explaining what you think the primary habitat should be described as for this point.

5. Overstory Data

Anything 3.0m or taller should be considered part of the overstory.

- a. **% Overstory:** Estimate the *total* percent coverage of all overstory trees within a 50m radius of the point-count station. Use 1%, 5%, or multiples of 10% when estimating % overstory cover. If no overstory cover is present, record "0" for % overstory cover. Refer to Figure 6 at the end of this section for examples of what various cover percentages look like.
- b. **Overstory Mean Height:** At each point-count station, estimate the *average height to the top of the overstory trees* within a 50m radius to the nearest 1m. Use a rangefinder to help gauge estimates. If no overstory cover is present, record "0" for mean canopy height.
- c. **# of Snags:** Count the numbers of snags (trees that are completely dead) that are $\geq 3\text{m}$ high and ≥ 6 inches dbh) within a 50m radius of the count station. If there are so many snags that counting every snag is logistically difficult (100+) count the snags within a quarter of the 50m radius and multiply that number by 4 to get an estimate of the number of snags (if you count 78 snags in a quarter of the 50m radius you would record 312 snags; 78×4). Please take the time to count all snags within the 50m radius whenever possible and never record 100+, 200+, etc.

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 50m radius of each point count station; you can list up to five species. Record tree species on the datasheet using the correct two-letter vegetation code (see Appendix B for plant species codes). Use 1%, 5%, or multiples of 10% when estimating overstory composition. It is acceptable for the largest value to be something other than 1%, 5%, or a multiple 10% so that the overall species composition total equals 100%. Note that if only one tree species is present in the overstory the relative percent should be 100%, regardless of how much of the % overstory cover.

Note that Snags (SN), dead trees (DC or DD), and burned trees (BU) should be considered part of the overstory species composition if they are $\geq 3\text{m}$ tall.

If you are able to identify an overstory species but it is not included on the list of codes, record "XX" on the datasheet. In the margin on the right, specify what XX equals. After the field season we can add this species and assign it a unique code. If you have multiple XX species, record XX₁, XX₂, and so on. If you come across a species you cannot identify, even after you've consulted your vegetation guide after the survey is over, record one of the unknown codes on your datasheet (UC for unknown conifer, UD for unknown deciduous, or OT for other).

6. Understory Data

Use this category to estimate the percent cover and species makeup of any woody vegetation (including seedling trees) that is $\geq 0.25\text{m}$ high and $< 3.0\text{m}$ high. Anything shorter than 0.25m should be considered part of the ground cover category. Grasses, rushes, reeds, sedges, and herbaceous species should **not** be recorded in the understory layer regardless of height. Instead, they should be recorded in the ground cover section. 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 Understory Layer section.

- a. **Understory Cover:** Estimate the total percent coverage of all woody shrub species AND seedling trees present within 50m of the count station. Use 1%, 5%, or a multiple of 10% to estimate the % understory

cover. If no understory cover is present, record "0" for % understory cover. Refer to Figure 6 for examples of what % covers look like.

- b. **Mean height:** Estimate the average height to the nearest 0.25m of the understory layer. If no understory cover is present, record "0" for understory height.
- c. **Species composition:** Identify the dominant understory species (including seedling trees) present and record the *relative* abundance of the total understory layer occupied by each species within a 50m radius of each point-count station; you can list up to five species. Record understory species on the data forms using the correct two-letter vegetation code (see Appendix B for plant species codes). Use 1%, 5%, or multiples of 10% when estimating understory layer composition. It is acceptable for the largest value to be something other than 1%, 5%, or a multiple 10% in order for the sum of the species composition to equal 100%. Note that if only one understory species is present, the relative percent should be 100%, regardless of how much of the circle the species occupies.

Note that Snags (SN), dead trees (DC or DD), and burned trees (BU) should be considered part of the understory species composition if they are $\geq 0.25\text{m}$ and $< 3\text{m}$ tall.

If you are able to identify an understory species but it is not included on the list of codes, record "XX" on the datasheet. In the margin on the right, specify what XX equals. After the field season we can add this species and assign it a unique code. If you have multiple XX species, record XX₁, XX₂, and so on. If you come across a species you cannot identify, even after you've consulted your vegetation guide after the survey is over, record one of the unknown codes on your datasheet (UC for unknown conifer, UD for unknown deciduous, or OT for other).

7. Ground Cover Data

We classify ground cover into eight categories. For each of these categories, estimate the total percent of ground cover within 50m of the count station. Use 1%, 5%, or multiples of 10% when estimating % ground cover. It is acceptable for the largest ground cover value to be something other than 1%, 5%, or a multiple 10% in order for the sum of the ground cover to equal 100%. We also record the average height for dead standing grass, and for live grass **and** herbaceous plant height.

The ground cover data collected are:

- a. Snow:
- b. Water:
- c. Woody: vegetation below 0.25m (roughly 10 inches) including cacti;
- d. Dead and down: trees (with a minimum dbh of 6") which do not reach 0.25m tall at their highest point;
- e. Herbaceous: broad-leaved herbaceous plants and forbs;
- f. Bare/Litter: % of bare ground (including rocks) and and/or ground covered by leaf litter (including all woody debris with a dbh < 6");
- g. Dead standing grass: includes grass, rushes, reeds, and sedges that are no longer alive and are clearly from the previous year's growing season;
- h. Live grass: includes grasses, rushes, reeds, and sedges that are still green or are clearly from this year's growing season. Note: wheat is a grass and should be factored into the % live grass cover;
- i. Dead standing grass height: estimate the average height of all dead grass (including rushes, reeds, and sedges) that are no longer alive and are from the previous year's growing season. Estimates should be to the nearest centimeter and include all dead grass within the 50m radius. Note: wheat stubble should be considered dead standing grass and factored into estimating the dead standing grass height;
- j. Grass and herbaceous height: estimate the average height of the living grass species **AND** all herbaceous plants to the nearest centimeter within the 50m radius. You should use your datasheet (21.5cm x 28cm) or pencil (15cm) to help you estimate.

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Note: Please put a “0” in the box for any ground cover category that is absent from the 50m circle, rather than leaving it blank. If no dead standing grass cover is present, record a “0” for dead standing grass height. If no live grass **OR** herbaceous cover is present, record a “0” for grass and herbaceous height.

Field Protocol for Spatially Balanced Sampling of Landbird Populations

IMBCR Point-Transect Form

Observer (Login ID)			Date (YYYY/MM/DD)			GPS Unit #:			Transect ID			Time	0502	0940				
NLR			2011 07 05			1228			WY-BCR10-BU2			Sky	2	1				
Access Point UTMs			ZONE:			UTMs:						Wind	0	0				
Point info																		
1	N	N	Private property?	1	N	Meadow Present	% Overstory	# Shrubs	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 %
2	N	N		2	N	Citrus?												
3	N	N		3	N	P-dog lawn?												
4	Y	6		4	N	P-dogs present?												
5	N	9		5	N	Cheatgrass?												
6	N	5		6	N													
7	N	6		7	N													
8	Y	8		8	N													
9	N	7		9	N													
10	N	5		10	N													
11	N	6		11	N													
12	Y	8		12	N													
13	N	10		13	N													
14	N	6		14	N													
15	Z	5		15	Y													
16	Y	7		16	N													

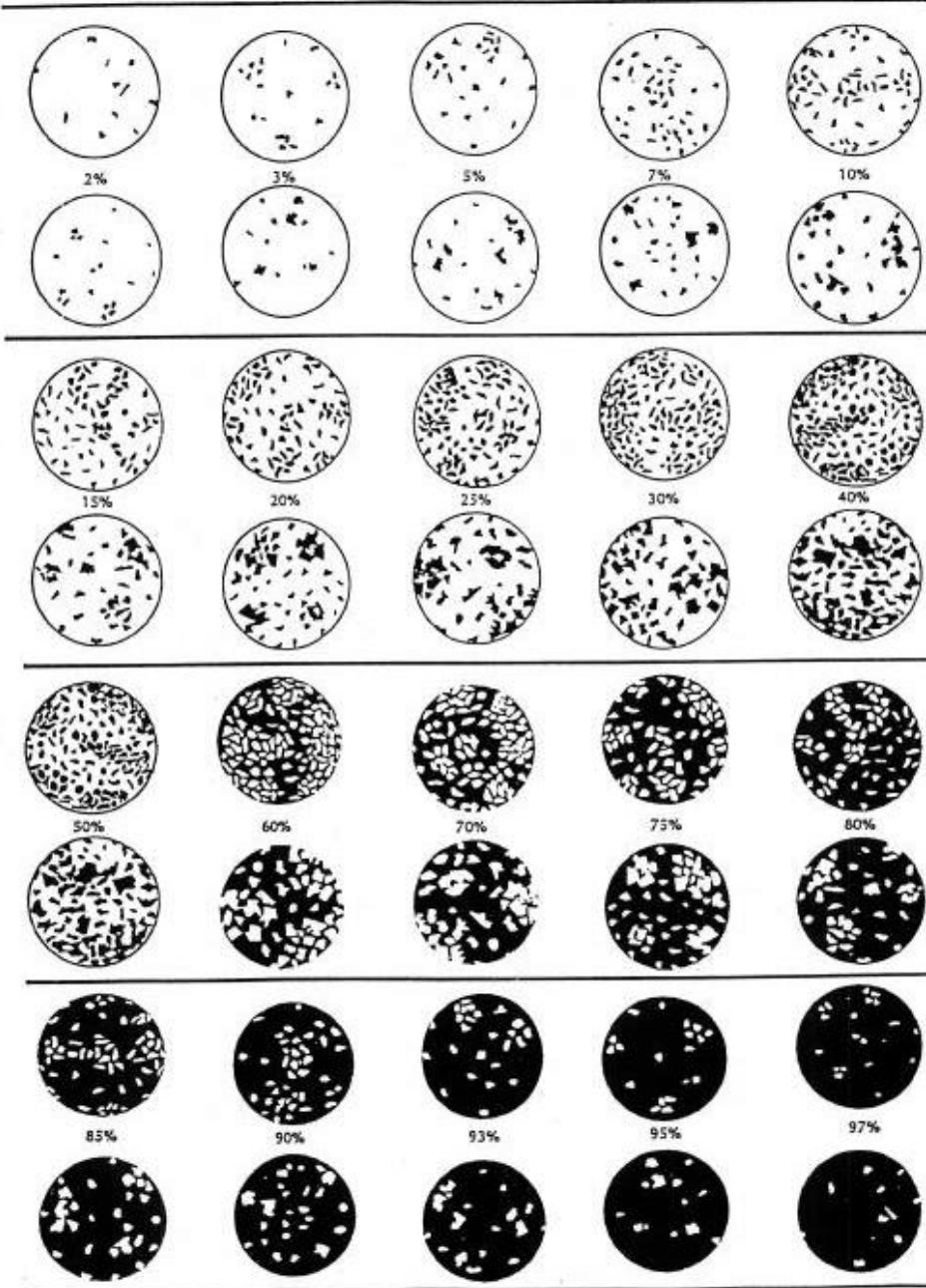
Understory layer - all spp. total to 100%															
Point	% Shrub Cover	Shrub Mean Height (m)	Species #1	Sp 1 abund %	Species #2	Sp 2 abund %	Species #3	Sp 3 abund %	Species #4	Sp 4 abund %	Species #5	Sp 5 abund %			
1	5	0.5	L P	90	C J	10									
2	5	0.25	L J	60	L P	40									
3	5	0.5	L P	60	C J	40									
4	5	0.5	L J	70	L P	20	S U	10							
5	1	2.0	L P	100											
6	5	1.0	L P	90	C J	10									
7	5	1.25	L P	90	C J	10									
8	5	0.5	L P	60	C J	40									
9	1	0.25	L P	60	C J	40									
10	5	1.0	L P	60	C J	40									
11	10	2.0	L P	90	C J	10									
12	5	1.5	L P	50	C J	40	G B	10							
13	5	1.5	L P	90	C J	10									
14	5	2.25	L P	100											
15	20	2.5	L P	40	C J	30	A S	20	G B	10					
16	10	1.5	L P	80	C J	10	G B	10							

If found, please mail to:
 Bird Conservancy of the Rockies
 230 Cherry St, Fort Collins, CO 80521
 Or call: (970) 482 - 1707

Ground Cover - totals to 100%														
Points	% Snow	% Water	% Woody	% Dead and Down	% Herbaceous	% Bare / litter	% Dead Standing Grass	% Live Grass	Dead Standing Grass height (cm)	Live Grass & Herb. Height (cm)				
1	0	0	15	1	20	54	10	10	7	16				
2	0	0	10	5	10	69	1	5	8	14				
3	0	0	10	5	5	70	5	5	8	17				
4	0	0	10	10	5	73	1	1	7	16				
5	0	0	5	5	10	78	1	1	9	17				
6	0	0	5	5	10	78	1	1	11	17				
7	0	0	5	1	5	87	1	1	7	14				
8	0	0	5	5	5	79	1	5	8	12				
9	0	0	5	5	5	10	5	5	78	1	1	8	11	
10	0	0	10	5	5	78	1	5	78	1	1	12	14	
11	0	0	10	1	5	78	1	5	78	5	1	11	16	
12	0	0	10	5	10	73	1	1	7	17				
13	0	0	10	5	20	50	5	10	9	16				
14	0	0	10	10	5	69	1	5	9	16				
15	0	0	10	10	5	73	1	1	8	14				
16	0	0	10	5	5	74	1	5	10	15				

Figure 5. Example of a completed Vegetation Datasheet.

COVER ESTIMATOR
(PERCENTAGE OF DARK AREA)



Barry, Sheila. 1994. Monitoring Vegetation Cover. Alameda County Resource Conservation District, 1996 Holmes St., Livermore, CA 94550

Figure 6. Examples of percent cover.

E. Point Information Datasheet

There is a simple datasheet on the back of the vegetation datasheet with 16 lines on it to record a reason why you were unable to survey a point (Figure 7). Values that can be entered for reasons points were not conducted are listed below from highest importance to lowest importance. If more than one code applies, please record only the code of highest importance (e.g., if you were denied permission, but also ran out of time to survey a point you would record only P: Private Property – Denied Permission).

P:	Private Property - Denied <u>Permission</u>
N:	Private Property - <u>No</u> contact with landowner
U:	Terrain <u>Unsafe</u> (could not safely approach to within 25 m of point)
R:	Can't cross <u>River</u>
S:	<u>Snow</u> pack impassible
H:	Running water near point - unable to <u>Hear</u>
W:	<u>Weather</u> (rain or wind)
G:	No <u>GPS</u> reception, cannot find point
T:	Ran out of <u>Time</u> (5 hours past sunrise or noticeably decreased bird activity)
O:	<u>Other</u> - explain

You may run into other unexpected issues in the field preventing you from conducting a point count. For these instances record “O” for “Other” and be sure to take detailed notes on why the point was not conducted. We need to report this information to our funders after the field season, so the more information you provide us, the less we will have to contact you with questions after the field season.

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Point	Landowner Info/Reasons points were not conducted
1	
2	
3	O: Pt. on public property, but denied access by USFWS b/c of active wolf den.
4	
5	
6	
7	
8	
9	U Scree slope (steep)
10	
11	
12	
13	
14	
15	P Mr. Johnson denied access
16	P " " "

Observer Initials (all three) Year State BCR Transect Name (e.g. RM99)

N	V	L	2010	WY	10	SR09
---	---	---	------	----	----	------

Order of Importance	Please record the reasons why you did not survey certain points within the grid (if applicable). If more than one of the codes below apply, please record ONLY the code of highest importance.
	<ul style="list-style-type: none"> P: Private Property - Denied Permission N: Private Property - No contact with landowner U: Terrain Unsafe (could not safely approach to within 25 m of point) R: Can't cross River S: Snow pack impassible H: Running water near point - unable to Hear W: Weather (rain or wind) G: No GPS reception, cannot find point T: Ran out of Time (Past 11am or noticeably decreased bird activity) O: Other - explain

Figure 7. Example of a completed Point Information Datasheet.

F. Collecting Bird Data

1. General Info

It is extremely important to fill in the blanks at the bottom of both sides of each and every bird form. If a bird form does not have this information and it becomes separated from the vegetation datasheet, then there is no way for us to know what transect the data are associated with. These data would become useless and an entire day of data collection would be lost. Also, we scan all of our data, so the general info needs to be on both sides of the datasheet. Before starting your first point count, be sure to fill out this information:

1. **Observer:** Fill in your unique login code on all pages of the bird form.
2. **Date:** Record the date you are conducting the survey (MM/DD/YY).
3. **Transect ID:** Fill in the complete transect name (i.e. CO-BCR16-AO1) on all pages of the bird form. It is vital that you include the state and BCR in the name to avoid confusion with other strata.
4. **Page number:** Fill in the page number associated with the bird data. Please count each side of a datasheet as a page.

2. Point Data

Enter the number of the point (01-16) on the transect you are about to survey. **NOTE:** for entries of low density species *between points* leave a blank row on the datasheet and enter "88" as the minute (see below for more information on "88" birds). After recording the general habitat data at the point count station and denoting the point you are at on the bird datasheet, record the time next to the point number in military format, using Mountain Daylight Time (MDT) regardless of the time zone you are in. At training, you will be instructed on how to set the clock on your stopwatch to MDT, and you will refer to that clock when recording time.

Once you have recorded the time and the point you are about to survey, activate your timepiece and begin recording the birds you see and hear. The count duration is six minutes. It is extremely important to document the minute of the count that an individual bird was first detected. To do this, simply write the number of the minute under the "minutes" column each time the beeper goes off. DO NOT record any birds after the six minutes are over, even if it is an interesting bird. If you do not detect any birds during a minute interval, record "NOB!" (No Birds) for 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 correctly as it is impossible to pay attention to the birds and note how much time (by looking at your time piece) has passed simultaneously. If, during your six minute survey, you detect a bird that was flushed from the survey point upon your arrival (before you began the six minute survey), record the bird's original distance from the survey point, because we assume that these birds would have remained at their original locations were it not for the disturbance created by the observer.

While conducting counts, be sure to focus primarily on birds that are close to the point. Although 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. **Note:** Do not use a scope when conducting point counts. It is more important to focus on and accurately record birds that are close to you rather than those that are far away. Binoculars will be sufficient for visual bird identification.

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 six 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 where you are conducting the point in order to identify a bird that you have detected from the point but **ALWAYS** return to the point as soon as possible. Do not chase birds before or during the count. After the six minutes are up, you may chase down a bird that you couldn't identify during the six minute count in order to get an identification, but do not leave the point during the six minutes and do not record birds for the count that were only detected while chasing another bird after the count. **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 or see individual birds on multiple points. It is okay to record the same bird on multiple points as long as the bird is not moving in response to your presence. For example, if you see a Western Meadowlark on a power line, and that same Western Meadowlark is visible at the same location from the next two points, you would record it on all three point counts. Additionally, if you see a Red-tailed Hawk soaring above you, and still see the hawk soaring on another point, you would record it on both points. However, if you survey three points along a fence and as you move between points a Loggerhead Shrike keeps moving away from you and re-perching on the fence, you should record that bird on the first point only. Additionally, you should mentally track birds that may move around you during a point so as not to double count them during a single six-minute count.

For each independently detected bird, you will record:

1. Start Time
2. Point Number
3. Each minute during the count
4. Species, using 4-letter codes
5. Radial Distance (m) to each bird
6. How
7. Sex of the bird
8. If the bird was visually identified
9. If you believe the bird is a migrant
10. The cluster size and cluster ID code.

Please refer to Figure 8 at the end of this section for an example of a completed bird datasheet.

3. Start time

Record the start time (in Mountain Daylight Time) at each point count location next to the point number before you start your count.

4. Point Number

Enter the number of the point on the transect-you are about to survey. Indicate the start of a new point by leaving a blank line on the data form and recording the next point number. If observations from one point span multiple pages, be sure to include ("cont.") next to the point number at the top of the next page. **NOTE:** for birds detected between points that have not been recorded on previous points record "88" for the point number (see below for more information).

5. Minute (1 – 6)

Record the minute you are in during the six minute count. Minute 1 is from 0-60 seconds. Your timer will give a series of beeps each minute to let you know when the next minute interval has begun.

6. Species

All birds detected during the six-minute count period will be recorded using the correct four-letter codes (See Appendix C for bird species codes; please commit to memory codes that do not follow the general code convention). If you ever record a bird and are unsure of the four-letter code, make a note with the full species name in the notes section at the bottom of the page to avoid confusion later.

PLEASE, PLEASE use correct codes, as it makes data entry, proofing, and analyses easier. Species that cause particular problems for observers include: **Cackling Goose** (CACG not CAGO), **Canada Goose** (CANG not CAGO), **Northern Shoveler** (NSHO, not NOSH), Ring-necked Pheasant (RINP, not RNPH), **Barn**

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Owl (BNOW not BAOW), **Barred Owl** (BDOW not BAOW), **Broad-tailed Hummingbird** (BTLH not BTHU), **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), **Cactus Wren** (CACW not CAWR), **Canyon Wren** (CANW not CAWR), **Cedar Waxwing** (CEDW not CEWA), **Black-throated Gray Warbler** (BTYW not BTGW), **MacGillivray's Warbler** (MGWA, not MAWA), **Canyon Towhee** (CANT not CATO), **Lark Bunting** (LARB, not LABU), **Sage Sparrow** (SAGS not SASP), **Savannah Sparrow** (SAVS, not SASP), **Lazuli Bunting** (LAZB, not LABU) and **Red-winged Blackbird** (RWBL, not RWBB).

Some individuals can be identified to subspecies. If you are able to visually identify an individual to subspecies use the four-letter codes below. Please do not make assumptions regarding which subspecies you detected (i.e., you need to visually identify individuals to subspecies).

Subspecies	Code	Subspecies	Code
Dark-eyed Junco (Gray-headed)	GHJU	Northern Flicker (Yellow-shafted)	YSFL
Dark-eyed Junco (Oregon)	ORJU	Northern Flicker (Intergrade)	FLIN
Dark-eyed Junco (Pink-sided)	PSJU	Northern Flicker (Red-shafted)	RSFL
Dark-eyed Junco (Red-backed)	RBJU	White-crowned Sparrow (Gambel's)	GWCS
Dark-eyed Junco (Slate-colored)	SCJU	White-crowned Sparrow (Mountain)	MWCS
Dark-eyed Junco (White-winged)	WWJU	Yellow-rumped Warbler (Audubon's)	AUWA
		Yellow-rumped Warbler (Myrtle's)	MYWA

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If you detect a bird that you are unable to identify, use the appropriate unknown bird code. Never guess on the identity of a bird. This is 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 and practice before performing more point counts. Below is a table of unidentified bird codes you can use:

Unknown Bird	Code	Unknown Bird	Code
Unknown Accipiter	UNAC	Unknown Longspur	UNLO
Unknown Bird	UNBI	Unknown Meadowlark	UNME
Unknown Blackbird	UNBL	Unknown Myiarchus	UNMY
Unknown Buteo	UNBU	Unknown Nuthatch	UNNU
Unknown Cardinal	UNCA	Unknown Oriole	UNOR
Unknown Chickadee	UNCH	Unknown Owl	UNOW
Unknown Cormorant	UNCT	Unknown Quail	UNQU
Unknown Corvid	UNCO	Unknown Raptor	UNRA
Unknown Cowbird	UNCB	Unknown Raven	UNRV
Unknown Dove	UNDO	Unknown Sandpiper	UNSA
Unknown Duck	UNDU	Unknown Sapsucker	UNSS
Unknown Empidonax	UNEM	Unknown Sparrow	UNSP
Unknown Falcon	UNFA	Unknown Swallow	UNSW
Unknown Finch	UNFI	Unknown Swift	UNSI
Unknown Flicker	UNFR	Unknown Tanager	UNTA
Unknown Flycatcher	UNFL	Unknown Thrasher	UNTR
Unknown Gnatcatcher	UNGN	Unknown Thrush	UNTH
Unknown Grouse	UNGR	Unknown Towhee	UNTO
Unknown Gull	UNGU	Unknown Vireo	UNVI
Unknown Hawk	UNHA	Unknown Warbler	UNWA
Unknown Hummingbird	UNHU	Unknown Woodpecker	UNWO
Unknown Jay	UNJA	Unknown Wren	UNWR
Unknown Kingbird	UNKI		

If no birds are detected during a one-minute period, enter “NOBI” (No Birds) in the space for four-letter bird codes. If no birds are detected during a six minute count, you should have six time periods recorded, each with “NOBI” written next to it. Recording “NOBI” will help you keep track of your minute intervals, and the data will reflect that you did conduct a full six minute count.

7. Distance

Using your rangefinder, measure the distance from the point count station to each and every individual bird detected during the count and record the distance in meters on the datasheet under “Radial Distance”. If you detect a bird at one kilometer (1000m) or beyond, enter the distance as “999”. Please note that we record radial (horizontal) distance, not straight line distance. For example, 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. If you cannot get a direct line of sight to the location of a bird, estimate the distance that bird is from a visible point and use the rangefinder to measure to that point. Then add or subtract the additional estimated distance between that point and the bird to obtain the

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best possible distance estimate from the point to the bird. Please estimate the distance from the visible point to the bird BEFORE using the rangefinder to get the distance from you to that point. Distance-sampling relies upon the assumption that you measure all distances accurately, so use your rangefinder to determine a distance for every bird detection!

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 object. If you see or hear a bird that is beyond the range of the rangefinder, estimate the distance the bird is past a point that is within-range of your rangefinder and add that distance to what the rangefinder displays. Once again, estimate the distance between the bird and point-within-range BEFORE using the rangefinder to get the distance from you to that point. 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, bird data recorded without associated distances CANNOT be used in analyses! We will further explain the premises behind Distance-sampling during training. But please, please, please do not forget to measure and record radial distances for EACH bird recorded on point counts.

8. How

In the "How" column, record how each bird was detected (i.e., 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 in the upper left portion of the box. Remember that how you detect a bird may be different from how you identify it.

It is important for us to know when birds sing because it is a strong indicator that the individual is holding a breeding territory (and thus, potentially a 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 lower right portion of the 'How' box. Note, "S" is the only valid detection code in the lower right portion of the "How" box.

Flyovers: A bird observed flying over a point without showing any signs of using the surrounding habitat should be recorded as a "flyover". However, individuals of species that habitually hunt on the wing (e.g., raptors, swallows, swifts) or appear to be foraging (e.g., crossbills, goldfinches, waxwings) in the vicinity of the point should NOT be treated as flyovers. Just because a bird is flying does not make it a flyover. Additionally, individuals that you first detect in flight that are simply flying from perch to perch nearby should NOT be recorded as flyovers. For true flyovers, enter an "F" in the "How" column.

9. Sex

In the "Sex" column, record the sex of the bird (M or F) if you visually observe a sexually dimorphic species and can identify the sex of the individual. If you are unable to visually observe the bird, or if the bird is of a species that does not exhibit sexual dimorphism, record the sex as "U" for unknown. Change the "U" to "M" or "F" if you later identify the same individual as male or female. Females of many bird species sing at least occasionally, and female singing behavior of many species is poorly understood, so please do not assume that singing birds are males.

If you record a bird and visually identify it as a juvenile, record "J" in the Sex column. The surveys we conduct are for breeding birds and juveniles do not fall into this category. Recording birds as juveniles will allow us to remove these birds from analyses while retaining proof of breeding behavior for the location.

Example: On a point count, you detect six birds. You see a male RNSA, you hear a RNSA calling, you hear a calling WBNU, you see a male AUWA that later sings, you hear a singing CHSP, and you see a brown-plumaged CAFI. In order, the "How" column should be filled in with V, C, C, V/S, S, and V. Fill in the "Sex"

column: M, U, U, M, U, and U respectively (male CAFI require two years to achieve adult plumage, thus a brown-plumaged bird cannot be sexed in the field).

10. Visual

In the "Visual" column enter a checkmark if you were able to visually identify the individual at any time during the survey. Check this box even if you recorded "V" for the detection type. This column is meant to further assure crew leaders and partners of proper identification. You may also check this box if you visually identify the individual before, during or after the point count. **Note:** If a bird was detected visually but identified by another means AND you were never able to positively identify the individual by sight then do NOT check the visual checkbox.

11. Migrating?

In the "Migrating?" column enter a checkmark if you have reason to believe the detected individual is not on its breeding territory. Clues that a bird may be migrating through are: 1) the bird is in a large flock 2) the bird is in unusual habitat that differs substantially from where it is typically found during the breeding season (e.g., a Brewer's Sparrow that is detected in a desert environment with no sagebrush) or 3) the bird is outside of its typical breeding range.

12. Cluster Count/Cluster ID

"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; single species flocks and paired birds. In order for multiple birds to be considered a cluster, they must:

1. Be of the same species;
2. Be detected on during the same minute interval during a point count;
3. Be within 20m of one another;
4. Not be two singing males.

The Cluster Code is only used to link clusters that take up multiple lines on the datasheet.

Please record the two types of clusters as follows.

Flocks: When two or more 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 ...). The Cluster Code is only used to link clusters that take up multiple lines on the datasheet.

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. Alternatively, 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 datasheet, with the appropriate codes for "HOW" detected and "Sex". 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 ...).

Example: 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

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see the bird and notes that the calling bird is a male BHGR 27m away AND also notes that there is a female BHGR in the same tree, but about 29m away. Next, the observer hears 5 Pine Siskins (PISI), looks up, and measures that they are 36-38m 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 17m away. The sex of both individuals is unknown, but the method of detection differs, so they should be recorded on separate lines with a common Cluster Code. The observer's data looks like this:

Time	Point #	Minute	Species	Radial Distance	How	Sex	Visual	Migrant?	Cluster	
									Size	Code
0552	03	1	WETA	46	S	M	X		1	
			AMRO	103	S	U			1	
		2	BHGR	27	C	M	X		1	A
			BHGR	29	V	F	X		1	A
		3	PISI	37	C	U	X		5	
		4	NOBI							
		5	MOCH	17	C	U	X		1	B
			MOCH	17	V	U	X		1	B
		6	NOBI							

13. Mammals

Yes, mammals. In an effort to incorporate other information into our bird monitoring programs, we are also collecting data on red squirrels (RESQ), Abert's squirrels (ABSQ), and Pika (PIKA) during point counts. Treat these three mammal species as you would a bird on point counts (fill in the radial distance, how, sex, and visual boxes). Please do not forget to record these mammals **and** their associated data at all point counts, as the utility of these data depend on everyone collecting them throughout the study areas.

14. "88" Birds:

It is important to track occurrences of all species at each transect. To do this we document detections of species that we have not detected while actively conducting point counts (these are detections that occur while collecting vegetation data, walking between points, etc.) on the transect. In order to ensure that the detection occurred on the transect grid, you should only record "88 Birds" after completing the first point count and before beginning the last point count of the morning. Please do not record "88" birds that you detect while approaching the transect in the morning or after finishing your last point count. To record an "88" bird, leave a single blank row between your last point count detection and record the Species Code, How, Visual, Migrant? and Custer Size for the "88" detection. You do not need to record distance for these detections. If you record an "88" bird and then subsequently detect that individual on a point count, please cross out the "88" detection.

If you encounter a rare or unusual species before or after you've started surveying, you should record this information in the notes section at the bottom of the bird data page (see next section). You will need to record the Species Code, UTM coordinates, and your distance to the nearest point count station.

15. Transect notes

Enter information relevant to the site or individual points in the notes section at the bottom of the datasheet. This is a good place to record problems encountered during the survey, or anything that may have affected your point counts (loud noises, cows, etc.)

This is also the location to record notes regarding rare or unusual birds. It is very important to make notes about rare or unusual birds because after the field season, Bird Conservancy 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 may be questioned later, it is helpful to write notes to affirm your detection. Useful notes regarding a rare species

Field Protocol for Spatially Balanced Sampling of Landbird Populations

should include information regarding key field marks (both visual and/or auditory), the age and sex of the bird, how you differentiated the rare species from other, similar, species and any relevant information regarding behavior and/or weather conditions. Also, if you were able to obtain a photo or audio recording of the species please bring this to the attention of your supervisor.

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

16. VERY IMPORTANT

Check over your point-count data before leaving each count station to make sure you have recorded all the required information (e.g. distances, how, sex, etc.). Skip a line between entries for individual points. All individual birds on a particular point should be bunched together on the form; then you should leave a blank line before starting entries for the next point.

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Page 1 of 3

IMBCR Point Transect Bird Form										
How: V=visual; S=singing; C=calling; F=flyover; D=drumming; O=other aural detection										
Between points, point # = 88										
If found, please return to: PO Box 1232, Brighton, CO 80601 or call (970) 482-1707 ext. 24										
Start Time	Point #	Minute	Species	Radial Distance	HOW	Visual?	SEX	Migrating?	Cluster	Start Time
								Size	Code	
0457	01	1	HOL A	071	S	U				0536
			LISPI	122	S	U				141
			2STJA	186	F	✓U				HETHO
			3AMPIO	046	S	U				083
			4NOBI	—	—	—				5
			5CORAI	177	V	✓U				DEJUO
			6HOLA	108	S	U				064
										2
										4RWA
										051
										3NOBI
										—
										H
										DEJUO
										089
										✓
										M
										HAWOO
										028
										✓
										DUFL
										065
										S
										NOBI
										—
										6
										NOBI
										—
										A
0511	051	1	DEJUO	040	S	✓V	W	1	A	0547
			DEJUO	041	V	✓V	W	1	A	01
			RCKIO	083	S	U				DEJUO
			2TOSO	004	2	S	U			0545
			DEJUO	064	S	V				DUFLO
			3MOCH	034	C	U	2			0415
			4NOBI	—	—	—				MOCHI
			5HETHI	113	S	U				127
			10NOBI	—	—	—				5
										MOCHI
										126
										3YRWA
										072
										S
										NOBI
										—
										6AMRO
										136
										F
										✓U
										3
0522	131	1	NOBI	—	—	—				0603
			2YRWA	033	S	V	M			061
			3MOCH	041	C	U				NOBI
			4DEJU	120	S	U				113
			5NOBI	—	—	—				MOCHI
			6NOBI	—	—	—				111
										CLNUO
										013
										✓V
										3ATTW
										034
										S
										NOBI
										—
										5NOBI
										—
										6NOBI
										—
Notes:										
Observer Login	NVL	Date	7/11/11	State	WY	BCR	10	Transect Name (e.g., RM99)	S R Ø 9	

Figure 8. Example of completed Bird Datasheet.

VII. Other Important Information

Once you finish surveying the transect, and before leaving your site, don't forget to:

- 1) Check to make sure you entered your observer initials, transect ID, and page numbers on EACH page!
- 2) Record the end of transect data (time, temp, sky, wind, transect notes) immediately upon completing the transect!
- 3) Go through your datasheets carefully to make sure you have not forgotten to record ANY data. Your work is not done until you've reviewed your data from the morning!
- 4) Provide clear and explicit directions to the transect, including driving and hiking directions if necessary.
- 5) Send an OK message to your supervisor using your spot unit.

VIII. Potential Issues 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/or if you are wearing a hat. Avoid wearing sunglasses or hats that can affect your hearing or field of view 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 (equally). Avoid wearing bright colors that may attract species to you (hummingbirds, etc.) or frighten birds away from you.

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.

D. NO Pishing

Do not attract birds to you during the counts by pishing or playing bird calls. Pishing is permissible after the count in an 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. **Never pish or otherwise attract birds toward you when you are near a point that has not been completed!**

E. Vehicle (and other) Noise

Occasionally aircraft or other mechanical noise can be loud and reduce your ability to hear birds. In these instances, pause your stopwatch and wait for the noise to subside. Once the noise is gone, start your stopwatch again and resume the count where you left off. If excessive noise interrupts the count for more than one minute, start the survey again after the disturbance has passed. Include notes about disturbance in the notes on the datasheet.

F. 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. If you are unsure of the correct unknown code, make a note in the comments section so you can write the correct code in later.

G. Know the Area

Check out your survey area and familiarize yourself with the habitats found within the grid the day before you

survey a transect so you know what to expect. Plan out an access route the day before. You will be able to find your way in the dark more easily if you have already done the hike during daylight hours.

H. Practice

Practice identifying birds in a habitat or elevation range before counting in that area. Be familiar with the songs and calls of all species found in an area before conducting point counts there. Birding on-site the evening before is often helpful when camping at or near the transect. Study the list of bird species you are likely to come across in your study area (provided by your crew leader) along with audio recordings to practice before (and during) the field season.

I. 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 (light mist or drizzle is fine as long as it is not impacting the bird activity). 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. If you are unsure if the weather is impacting your ability to detect birds or resulting in decreased bird activity, conduct the count and review the data afterwards. If you detected very few birds or almost all of your detections were visual it is likely that your ability to hear and/or bird activity is impacted by the weather. In these instances make a note that the data should not be used for analyses.

IV. Literature Cited

- Blakesley, J. A., and D. J. Hanni. 2009. Monitoring Colorado's Birds, 2008. Technical Report M-MCB08-01. Rocky Mountain Bird Observatory, Brighton, Colorado, USA.
- Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, Oxford, UK.
- Leukering, T., M. Carter, A. Panjabi, D. Faulkner, and R. Levad. Revised 2005. Point Transect Protocol. Unpubl. document. Rocky Mountain Bird Observatory Brighton, Colorado, USA.

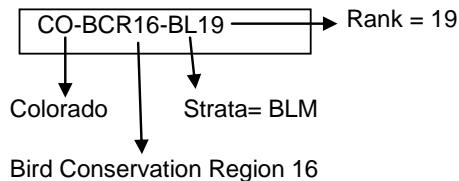
Appendix A. GPS Naming System

At the beginning of the field season, you will receive a GPS unit containing waypoints for each point on each transect assigned to you. The following is an example of how transects and points will be labeled in your GPS unit:

Monitoring Colorado Birds Grid Label & Point Label Explanation

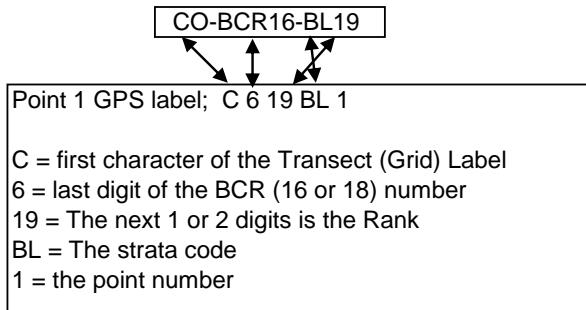
The Grid (Transect) labels are based on the State, Bird Conservation Region (BCR), Strata Code (ie. BLM = BL) and the Rank (This number corresponds with the order of the sample)

Grid Label Example



Point Label Example (16 points per Grid)

The point GPS label is related to the Transect (Grid) label by the following;



Point Number	GPS label	Grid with GPS labels	Number order is from upper right to left
1	C619BL1		
2	C619BL2		
3	C619BL3		
4	C619BL4		
5	C619BL5		
6	C619BL6		
7	C619BL7		
8	C619BL8		
9	C619BL9		
10	C619BL10		
11	C619BL11		
12	C619BL12		
13	C619BL13		
14	C619BL14		
15	C619BL15		
16	C619BL16		

Appendix B. Key of Two-Letter Codes for Shrubs and Trees

Code	Common Name	Scientific Name	States
AA	Acacia	<i>Acacia</i> sp.	AZ, KS, NM, OK, TX, UT
AG	Agave	<i>Agave</i> sp.	AZ, NM, TX, UT
AL	Alder	<i>Alnus</i> sp.	AZ, CO, ID, KS, MT, NM, ND, OK, TX, UT, WY
AE	American Elm	<i>Ulmus americana</i>	CO, KS, MT, ND, NE, OK, SD, TX, WY
HH	American Hophornbeam	<i>Ostrya virginiana</i>	KS, ND, NE, OK, SD, TX, WY
LI	American Linden / Basswood	<i>Tilia americana</i>	KS, ND, NE, OK, SD
AP	American Plum	<i>Prunus americana</i>	All
AM	Apache Plume	<i>Fallugia paradoxa</i>	AZ, CO, NM, OK, TX, UT
AW	Arizona Black Walnut	<i>Juglans major</i>	AZ, NM, TX
AC	Arizona Cypress	<i>Cupressus arizonica</i>	AZ, NM, TX, UT
AH	Ash	<i>Fraxinus</i> sp.	All
BA	Baccharis / Mule Fat	<i>Baccharis</i> sp.	AZ, CO, KS, NM, OK, TX
BP	Balsam Poplar	<i>Populus balsamifera</i>	CO, ID, MT, ND, SD, UT, WY
BT	Barrel Cactus	<i>Ferocactus</i> sp.	AZ, NM, TX, UT
BE	Beaked Hazelnut	<i>Corylus cornuta</i>	CO, ID, MT, ND, SD, WY
BG	Beargrass	<i>Nolina</i> sp.	AZ, CO, NM, OK, TX, UT
BM	Bigtooth Maple / Little Canyon Maple	<i>Acer grandidentatum</i>	AZ, CO, ID, MT, NM, TX, UT, WY
BI	Birch	<i>Betula</i> sp.	All
BY	Bitter Cherry	<i>Prunus emarginata</i>	AZ, ID, MT, NM, UT, WY
PT	Black Cottonwood	<i>Populus trichocarpa</i>	ID, MT, ND, WY, UT
BN	Black Walnut	<i>Juglans nigra</i>	CO, KS, ND, NE, NM, OK, SD, TX, UT
BB	Blackberry / Raspberry / Thimbleberry	<i>Rubus</i> sp.	All
BL	Blackbrush	<i>Coleogyne ramosissima</i>	AZ, CO, UT
BK	Bladder Sage	<i>Salazaria mexicana</i>	AZ, NV, TX, UT
BS	Blue Spruce	<i>Picea pungens</i>	AZ, CO, ID, NM, UT, WY
BX	Box Elder	<i>Acer negundo</i>	All
BR	Bristlecone Pine	<i>Pinus aristata</i>	AZ, CO, NM
AB	Buckthorn	<i>Rhamnus</i> sp.	All
BF	Buffaloberry	<i>Shepherdia canadensis</i>	AZ, CO, ID, MT, ND, NM, SD, UT, WY
BO	Bur Oak	<i>Quercus macrocarpa</i>	CO, KS, MT, ND, NE, NM, OK, SD, TX, WY
BC	burnt conifer	NULL	All
BD	burnt deciduous	NULL	All
BW	Burroweed	<i>Isocoma tenuisecta</i>	AZ, NM, TX
LU	Bush Lupine	<i>Lupinus</i> sp.	All
BH	Buttonbush	<i>Cephaelanthus occidentalis</i>	AZ, KS, NE, OK, TX
CL	Catalpa	<i>Catalpa</i> sp.	KS, NE, OK, SD, TX
CM	Catclaw mimosa	<i>Mimosa aculeaticarpa</i>	AZ, NM, TX
CA	Ceanothus	<i>Ceanothus</i> sp.	All
CB	Chaffbush	<i>Amphipappus</i> sp.	AZ, NV, UT
CK	Chickasaw Plum	<i>Prunus angustifolia</i>	CO, KS, NE, NM, OK, TX
CP	Chihuahuan Pine	<i>Pinus leiophylla</i>	AZ, NM
CC	Choke Cherry	<i>Prunus virginiana</i>	All
CH	Cholla / Pencil Cactus	<i>Cylindropuntia</i> sp.	AZ, CO, UT
CR	Cliffrose / Bitterbrush	<i>Purshia</i> sp.	AZ, CO, ID, MT, NE, NM, TX, UT, WY
CJ	Common Juniper	<i>Juniperus communis</i>	AZ, CO, ID, MT, ND, NE, NM, SD, UT, WY
CO	Condalia	<i>Condalia</i> sp.	TX
CW	Crack Willow	<i>Salix fragilis</i>	CO, ID, KS, MT, ND, NE, NM, SD, UT, WY
CE	Creosote	<i>Larrea tridentata</i>	AZ, UT
CT	Crucifixion Thorn	<i>Canotia holacantha</i>	AZ
DL	Dalea / Prairie Clover / Featherplume	<i>Dalea</i> sp.	All
DA	dead Aspen	NULL	All
DC	dead conifer	NULL	All
DD	dead deciduous	NULL	All
DJ	dead Juniper	NULL	All
DY	dead Pinyon Pine	NULL	All
DM	Desert Almond	<i>Prunus fasciculata</i>	AZ, NV, UT
DH	Desert Honeysuckle	<i>Anisacanthus thurberi</i>	AZ, NM
LV	Desert Lavender	<i>Hyptis emoryi</i>	AZ

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Code	Common Name	Scientific Name	States
DO	Desert Olive	<i>Forestiera neomexicana</i>	AZ, CO, NM, UT
DR	Desert Rue	<i>Thamnosa montana</i>	AZ, NV, UT
DE	Desert Willow / Desert Catalpa	<i>Chilopsis linearis</i>	AZ, KS, NM, OK,
DW	Dogwood	<i>Cornus sp.</i>	All
DF	Douglas Fir	<i>Pseudotsuga menziesii</i>	AZ, CO, ID, MT, NM, TX, UT, WY
EB	Elderberry	<i>Sambucus sp.</i>	All
EM	Elm	<i>Ulmus sp.</i>	All
ES	Engelmann Spruce	<i>Picea engelmannii</i>	AZ, CO, ID, MT, NM, UT, WY
FB	Fendlerbrush	<i>Fendlera rupicola</i>	AZ, CO, NM, TX, UT
FE	Fernbush	<i>Chamaebataria millefolium</i>	AZ, CO, NM, TX, UT
FH	Fool's Huckleberry	<i>Menziesia ferruginea</i>	ID, MT, WY
FC	Fremont Cottonwood	<i>Populus fremontii</i>	AZ, CO, NM, TX, UT
FM	Fremont Mahonia / Barberry / Desert Holly	<i>Berberis sp.</i>	AZ, CO, ID, KS, MT, ND, NE, NM, SD, UT
GO	Gambel Oak	<i>Quercus gambelii</i>	AZ, CO, NM, OK, SD, TX, UT, WY
TT	Glandulare Labrador Tea / Trappers Tea	<i>Ledum Glandulosum</i>	ID, MT, NV, UT, WY
GL	Globemallow	<i>Sphaeralcea angustifolia</i>	AZ, CO, KS, NE, NM, OK, TX,
GB	Gooseberry / Currant	<i>Ribes sp.</i>	All
GF	Grand Fir	<i>Abies grandis</i>	ID, MT
GW	Greasewood	<i>Sarcobatus sp.</i>	AZ, CO, ID, MT, ND, NE, NM, SD, TX, UT, WY
GA	Green Ash	<i>Fraxinus pennsylvanica</i>	CO, KS, MT, ND, NE, NM, OK, SD, TX, UT, WY
GM	Greenmolly	<i>Bassia americana</i>	AZ, CO, ID, MT, NM, NV, TX, UT, WY
GY	Gum Bully / Woolly Buckthorn	<i>Sideroxylon lanuginosum</i>	KS, OK, TX
HK	Hackberry	<i>Celtis sp.</i>	All
HA	Hawthorn	<i>Crataegus sp.</i>	All
HC	Hickory	<i>Carya sp.</i>	KS, ND, NE, OK, TX
HL	Honey Locust	<i>Gleditsia triacanthos</i>	All
HT	Hoptree	<i>Ptelea sp.</i>	AZ, CO, KS, NE, NM, TX, UT
HO	Horsebrush	<i>Tetramydia sp.</i>	AZ, CO, ID, MT, NM, NV, UT, WY
HB	Huckleberry	<i>Vaccinium sp.</i>	AZ, CO, ID, KS, MT, ND, NM, SD, TX, UT, WY
XX	Identified But Not Listed	NULL	All
IB	Indigo bush / Leadplant	<i>Amorpha sp.</i>	All
JO	Jojoba	<i>Simmondsia chinensis</i>	AZ, UT
JT	Joshua Tree	<i>Yucca brevifolia</i>	AZ, NV, UT
JU	Juniper	<i>Juniperus sp.</i>	All
KC	Kentucky Coffee Tree	<i>Gymnocladus dioica</i>	KS, ND, NE, OK, SD, TX
LM	Limber Pine	<i>Pinus flexilis</i>	AZ, CO, ID, MT, ND, NE, NM, SD, UT, WY
LW	Little Walnut	<i>Juglans microcarpa</i>	KS, NM, OK, TX
LL	Loblolly Pine	<i>Pinus taeda</i>	OK, TX
LT	Locust sp.	<i>Robinia sp.</i>	All
LP	Lodgepole Pine	<i>Pinus contorta</i>	CO, ID, MT, SD, UT, WY
LB	Lote Bush	<i>Ziziphus obtusifolia</i>	AZ, NM, OK, TX, UT
MD	Madrone	<i>Arbutus arizonica</i>	AZ, NM
MZ	Manzanita	<i>Arctostaphylos sp.</i>	AZ, CO, MT, NM, TX, UT, WY
ML	Maple	<i>Acer sp.</i>	All
ME	Mesquite	<i>Prosopis sp.</i>	AZ, CO, UT
MK	Mock Orange	<i>Philadelphus sp.</i>	AZ, CO, ID, MT, NM, OK, TX, UT, WY
MB	Mojave sea-blite	<i>Suaeda nigra</i>	AZ, CO, ID, MT, ND, NE, NM, SD, TX, UT, WY
MT	Mormon Tea	<i>Ephedra sp.</i>	AZ, CO, NM, OK, TX, UT, WY
MO	Mountain Ash	<i>Sorbus scopulina</i>	AZ, CO, MT, ND, NM, SD, UT, WY
MH	Mountain Hemlock	<i>Tsuga mertensiana</i>	ID, MT
MM	Mountain Mahogany	<i>Cercocarpus sp.</i>	AZ, CO, ID, KS, MT, NE, NM, OK, SD, TX, UT, WY
MS	Mountain Spray / Oceanspray	<i>Holodiscus sp.</i>	AZ, CO, ID, MT, NM, TX, UT, WY
MU	Mulberry	<i>Morus sp.</i>	All
NC	Narrow-leaf Cottonwood	<i>Populus angustifolia</i>	AZ, CO, ID, MT, NE, NM, SD, TX, UT, WY
LC	New Mexico Locust	<i>Robinia neomexicana</i>	AZ, CO, NM, TX, UT, WY
NB	Ninebark	<i>Physocarpus sp.</i>	All
OB	Oak	<i>Quercus sp.</i>	All
OL	Ocotillo	<i>Fouquieria splendens</i>	AZ, NM, TX
OR	Oreganillo	<i>Aloysia Wrightii</i>	AZ, NM, TX, UT
OX	Oregon Boxwood	<i>Paxistima myrsinoides</i>	All
OG	Oregon-grape	<i>Mahonia aquifolium</i>	AZ, CO, ID, MT, ND, NE, NM, SD, TX, UT, WY
OE	Osage Orange	<i>Maclura pomifera</i>	CO, KS, NE, NM, OK, SD, TX, UT

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Code	Common Name	Scientific Name	States
YE	Pacific Yew	<i>Taxus brevifolia</i>	ID, MT
PV	Palo Verde	<i>Cercidium floridum</i>	AZ
PB	Paper Birch	<i>Betula papyrifera</i>	CO, ID, MT, ND, NE, SD, WY
PW	Peachleaf Willow	<i>Salix amigdaloides</i>	All
PM	Persimmon	<i>Diospyros</i> sp.	KS, NE, OK, TX
PY	Pinyon Pine	<i>Pinus edulis</i>	AZ, CO, NM, OK, TX, UT, WY
PC	Plains Cottonwood	<i>Populus deltoides</i>	AZ, CO, KS, MT, ND, NE, NM, OK, SD, TX, UT, WY
PI	Poison Ivy	<i>Toxicodendron radicans</i>	AZ, KS, NE, OK, SD, TX
PP	Ponderosa Pine	<i>Pinus ponderosa</i>	AZ, CO, ID, MT, ND, NE, NM, OK, SD, TX, UT, WY
PO	Poplar	<i>Populus</i> sp.	All
PA	Prickly Ash	<i>Zanthoxylum americanum</i>	KS, ND, NE, OK, SD, TX
OP	Prickly Pear	<i>Opuntia</i> sp.	All
AS	Quaking Aspen	<i>Populus tremuloides</i>	AZ, CO, ID, MT, ND, NE, NM, SD, TX, UT, WY
RA	Rabbitbrush	<i>Chrysothamnus</i> sp.	AZ, CO, ID, KS, MT, NE, NM, OK, TX, UT, WY
BU	Ragweed / Bursage	<i>Ambrosia</i> sp.	All
RR	Range Ratany	<i>Krameria parvifolia</i>	AZ, NM, TX, UT
RS	Ratany	<i>Krameria</i> sp.	AZ, CO, KS, NM, OK, TX, UT
RG	Rayless Goldenhead	<i>Acamptopappus sphaerocephalus</i>	AZ, NV, UT
RB	Redbud	<i>Cercis</i> sp.	AZ, KS, NM, NE, OK, TX, UT
RD	Red-osier Dogwood	<i>Cornus sericea</i>	AZ, CO, ID, KS, MT, ND, NE, NM, SD, UT, WY
RH	Rhododendron	<i>Rhododendron</i> sp.	CO, ID, MT, OK, TX
MA	Rocky Mountain Maple	<i>Acer glabrum</i>	All
RO	Russian Olive	<i>Elaeagnus angustifolia</i>	All
SA	Sagebrush	<i>Artemisia</i> sp.	All
CG	Saguaro	<i>Carnegiea gigantea</i>	AZ
SL	Saltbush	<i>Atriplex</i> sp.	All
SD	Sand Cherry	<i>Prunus pumila</i>	CO, KS, MT, ND, NE, SD, UT, WY
SB	Serviceberry	<i>Amelanchier</i> sp.	All
SR	Shinnery Oak / Havard Oak	<i>Quercus havardii</i>	AZ, CO, KS, NM, OK, TX
LO	Shrub Live Oak	<i>Quercus turbinella</i>	AZ, CO, NM, TX, UT
SC	Shrubby Cinquefoil	<i>Pentaphylloides floribunda</i>	AZ, CO, ID, MT, ND, NM, SD, UT, WY
EL	Siberian Elm	<i>Ulmus pumila</i>	All
SI	Siberian Peashrub / Caragana	<i>Caragana arborescens</i>	CO, ID, MT, ND, NE, NM, SD, UT, WY
SM	Silver Maple	<i>Acer saccharinum</i>	KS, ND, NE, OK, SD, TX
SE	Single-leaf Ash	<i>Fraxinus anomala</i>	AZ, CO, NM, UT, WY
SK	Skunkbrush	<i>Rhus trilobata</i>	All
SS	Smooth Sumac	<i>Rhus glabra</i>	All
SN	Snag	NULL	All
SW	Snakeweed	<i>Gutierrezia sarothrae</i>	All
SY	Snowberry	<i>Symphoricarpos</i> sp.	All
YS	Soaptree Yucca	<i>Yucca elata</i>	AZ, NM, TX, UT
PS	Southwestern White Pine	<i>Pinus strobusiformis</i>	AZ, CO, NM, TX
ST	Spindletree / Wahoo	<i>Euonymus</i> sp.	CO, KS, MT, ND, NE, OK, SD, TX
SH	Spiny Hopsage	<i>Grayia spinosa</i>	AZ, CO, MT, NM, ID, WY
SP	Spiraea	<i>Spiraea betulifolia</i>	ID, MT, ND, SD, WY
SU	Subapline Fir	<i>Abies lasiocarpa</i>	AZ, CO, ID, MT, NM, UT, WY
SZ	Sugar Sumac	<i>Rhus ovata</i>	AZ
US	Sumac	<i>Rhus</i> sp.	All
PL	Sycamore	<i>Platanus</i> sp.	AZ, KS, NE, NM, OK, TX
TA	Tamarisk / Saltcedar	<i>Tamarix pentandra</i>	All
TR	Tarbush	<i>Florencia cernua</i>	AZ, NM, TX
TH	Tree of Heaven	<i>Ailanthus altissima</i>	AZ, CO, KS, NM, NE, OK, TX
TW	Twinberry / Bush Honeysuckle	<i>Lonicera</i> sp.	All
UC	Unknown coniferous species	NULL	All
UD	Unknown deciduous species	NULL	All
OT	Unknown Plant	NULL	All
VI	Viburnum	<i>Viburnum</i> sp.	CO, ID, KS, MT, ND, NE, NM, OK, SD, TX, WY
WB	Water Birch	<i>Betula occidentalis</i>	AZ, CO, ID, MT, ND, NE, NM, SD, UT, WY
WX	Waxflower	<i>Jamesia americana</i>	AZ, CO, NM, UT, WY
HE	Western Hemlock	<i>Tsuga heterophylla</i>	ID, MT
LA	Western Larch	<i>Larix occidentalis</i>	ID, MT, UT, WY
WC	Western Red Cedar	<i>Thuja plicata</i>	ID, MT

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Code	Common Name	Scientific Name	States
WW	Western White Pine	<i>Pinus monticola</i>	ID, MT, UT
WF	White Fir	<i>Abies concolor</i>	AZ, CO, ID, NM, UT, WY
WS	White Spruce	<i>Picea glauca</i>	ID, MT, SD, WY
WP	Whitebark Pine	<i>Pinus albicaulis</i>	ID, MT, WY
PF	White-stem Paper-flower	<i>Psilostrophe cooperi</i>	AZ, NM, UT
WT	Whitetop / Pepperweed / Cress Shrub	<i>Cardaria / Lepidium sp.</i>	All
WG	Wild Grape	<i>Vitis sp.</i>	All
WR	Wild Rose	<i>Rosa sp.</i>	AZ, CO, ID, KS, MT, ND, NM, SD, WY
WI	Willow	<i>Salix sp.</i>	All
WY	Wingleaf Soapberry	<i>Sapindus saponaria</i>	AZ, CO, NM, KS, OK, TX
WN	Winterfat	<i>Krascheninnikovia lanata</i>	All
WO	Wolfberry	<i>Lycium pallidum</i>	AZ, CO, NM, OK, TX, UT
YU	Yucca	<i>Yucca sp.</i>	AZ, CO, KS, MT, ND, NE, NM, OK, SD, TX, UT, WY

Appendix C. Four-Letter Bird Codes

Common Name	Code
Abert's Towhee	ABTO
Acorn Woodpecker	ACWO
Alder Flycatcher	ALFL
American Avocet	AMAV
American Bittern	AMBI
American Coot	AMCO
American Crow	AMCR
American Dipper	AMDI
American Goldfinch	AMGO
American Kestrel	AMKE
American Pipit	AMPI
American Redstart	AMRE
American Robin	AMRO
American Three-toed Woodpecker	ATTW
American Tree Sparrow	ATSP
American White Pelican	AWPE
American Wigeon	AMWI
Anna's Hummingbird	ANHU
Aplomado Falcon	APFA
Arizona Woodpecker	AZWO
Ash-throated Flycatcher	ATFL
Baird's Sandpiper	BASA
Baird's Sparrow	BAIS
Bald Eagle	BAEA
Baltimore Oriole	BAOR
Baltimore X Bullock's Oriole Hybrid	BBOH
Band-tailed Pigeon	BTPI

Common Name	Code
Bank Swallow	BANS
Barn Owl	BNOW
Barn Swallow	BARS
Barred Owl	BDOW
Barrow's Goldeneye	BAGO
Bell's Vireo	BEVI
Belted Kingfisher	BEKI
Bendire's Thrasher	BETH
Bewick's Wren	BEWR
Black Phoebe	BLPH
Black Rail	BLRA
Black Rosy-Finch	BLRF
Black Swift	BLSW
Black Tern	BLTE
Black Vulture	BLVU
Black-and-white Warbler	BAWW
Black-backed Woodpecker	BBWO
Black-billed Cuckoo	BBCU
Black-billed Magpie	BBMA
Black-capped Chickadee	BCCH
Black-capped Gnatcatcher	BCGN
Black-capped Vireo	BCVI
Black-chinned Hummingbird	BCHU
Black-chinned Sparrow	BCSP
Black-crested Titmouse	BCTI
Black-crowned Night-Heron	BCNH
Black-headed Grosbeak	BHGR

Common Name	Code
Black-necked Stilt	BNST
Blackpoll Warbler	BLPW
Black-tailed Gnatcatcher	BTGN
Black-throated Blue Warbler	BTBW
Black-throated Gray Warbler	BTYW
Black-throated Green Warbler	BTNW
Black-throated Sparrow	BTSP
Blue Grosbeak	BLGR
Blue Jay	BLJA
Blue-gray Gnatcatcher	BGGN
Blue-throated Hummingbird	BLUH
Blue-winged Teal	BWTE
Bobolink	BOBO
Bohemian Waxwing	BOWA
Boreal Chickadee	BOCH
Boreal Owl	BOOW
Botteri's Sparrow	BOSP
Brewer's Blackbird	BRBL
Brewer's Sparrow	BRSP
Bridled Titmouse	BRTI
Broad-billed Hummingbird	BBLH
Broad-tailed Hummingbird	BT LH
Broad-winged Hawk	BWHA
Bronzed Cowbird	BROC
Brown Creeper	BRCR
Brown Pelican	BRPE
Brown Thrasher	BRTH

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Common Name	Code
Brown-capped Rosy-Finch	BCRF
Brown-crested Flycatcher	BCFL
Brown-headed Cowbird	BHCO
Bufflehead	BUFF
Bullock's Oriole	BUOR
Burrowing Owl	BUOW
Bushtit	BUSH
Cackling Goose	CACG
Cactus Wren	CACW
California Gull	CAGU
California scrub jay	CASJ
California Quail	CAQU
Calliope Hummingbird	CAHU
Canada Goose	CANG
Canvasback	CANV
Canyon Towhee	CANT
Canyon Wren	CANW
Carolina Wren	CARW
Caspian Tern	CATE
Cassin's Finch	CAFI
Cassin's Kingbird	CAKI
Cassin's Sparrow	CASP
Cassin's Vireo	CAVI
Cattle Egret	CAEG
Cave Swallow	CASW
Cedar Waxwing	CEDW
Chestnut-backed Chickadee	CBCH
Chestnut-collared Longspur	CCLO
Chestnut-sided Warbler	CSWA

Common Name	Code
Chihuahuan Raven	CHRA
Chimney Swift	CHSW
Chipping Sparrow	CHSP
Chuck-will's-widow	CWWI
Chukar	CHUK
Cinnamon Teal	CITE
Clapper Rail	CLRA
Clark's Grebe	CLGR
Clark's Nutcracker	CLNU
Clay-colored Sparrow	CCSP
Cliff Swallow	CLSW
Common Black-Hawk	CBHA
Common Gallinule	COGA
Common Goldeneye	COGO
Common Grackle	COGR
Common Ground-Dove	COGD
Common Loon	COLO
Common Merganser	COME
Common Nighthawk	CONI
Common Poorwill	COPO
Common Raven	CORA
Common Tern	COTE
Common Yellowthroat	COYE
Cooper's Hawk	COHA
Cordilleran Flycatcher	COFL
Costa's Hummingbird	COHU
Crested Caracara	CRCA
Crissal Thrasher	CRTH
Curve-billed Thrasher	CBTH

Common Name	Code
Dark-eyed Junco	DEJU
Dark-eyed Junco (Gray-headed)	GHJU
Dark-eyed Junco (Oregon)	ORJU
Dark-eyed Junco (Pink-sided)	PSJU
Dark-eyed Junco (Red-backed)	RBJU
Dark-eyed Junco (Slate-colored)	SCJU
Dark-eyed Junco (White-winged)	WWJU
Dickcissel	DICK
Double-crested Cormorant	DCCO
Downy Woodpecker	DOWO
Dusky Flycatcher	DUFL
Dusky Grouse	DUGR
Dusky-capped Flycatcher	DCFL
Eared Grebe	EAGR
Eastern Bluebird	EABL
Eastern Kingbird	EAKI
Eastern Meadowlark	EAME
Eastern Phoebe	EAPH
Eastern Screech-Owl	EASO
Eastern Whip-poor-will	EWPW
Eastern Wood-Pewee	EAWP
Elegant Tropicbird	ELTR
Elf Owl	ELOW
Eurasian Collared-Dove	EUCD
European Starling	EUST
Evening Grosbeak	EVGR
Ferruginous Hawk	FEHA
Ferruginous Pygmy-Owl	FEPO
Field Sparrow	FISP

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Common Name	Code
Five-striped Sparrow	FSSP
Flame-colored Tanager	FCTA
Flammulated Owl	FLOW
Forster's Tern	FOTE
Fox Sparrow	FOSP
Franklin's Gull	FRGU
Gadwall	GADW
Gambel's Quail	GAQU
Gila Woodpecker	GIWO
Gilded Flicker	GIFL
Glossy Ibis	GLIB
Golden Eagle	GOEA
Golden-crowned Kinglet	GCKI
Golden-fronted Woodpecker	GFWO
Golden-winged Warbler	GWWA
Grace's Warbler	GRWA
Grasshopper Sparrow	GRSP
Gray Catbird	GRCA
Gray Flycatcher	GRFL
Gray Hawk	GRHA
Gray Jay	GRAJ
Gray Partridge	GRPA
Gray Vireo	GRVI
Gray-crowned Rosy-Finch	GCRF
Great Blue Heron	GBHE
Great Crested Flycatcher	GCFL
Great Egret	GREG
Great Gray Owl	GGOW
Great Horned Owl	GHOW

Common Name	Code
Great Kiskadee	GKIS
Greater Pewee	GRPE
Greater Prairie-Chicken	GRPC
Greater Roadrunner	GRRO
Greater Sage-Grouse	GRSG
Greater Scaup	GRSC
Greater Yellowlegs	GRYE
Great-tailed Grackle	GTGR
Green Heron	GRHE
Green Kingfisher	GKIN
Green-tailed Towhee	GTTO
Green-winged Teal	AGWT
Groove-billed Ani	GBAN
Gunnison Sage-Grouse	GUSG
Hairy Woodpecker	HAWO
Hammond's Flycatcher	HAFL
Harlequin Duck	HARD
Harris's Hawk	HRSH
Harris's Sparrow	HASP
Hepatic Tanager	HETA
Hermit Thrush	HETH
Hermit Warbler	HEWA
Hooded Merganser	HOME
Hooded Oriole	HOOR
Hooded Warbler	HOWA
Horned Grebe	HOGR
Horned Lark	HOLA
House Finch	HOFI
House Sparrow	HOSP

Common Name	Code
House Wren	HOWR
Hutton's Vireo	HUVI
Inca Dove	INDO
Indigo Bunting	INBU
Indigo x Lazuli Bunting Hybrid	ILBH
Juniper Titmouse	JUTI
Killdeer	KILL
Ladder-backed Woodpecker	LBWO
Lark Bunting	LARB
Lark Sparrow	LASP
Lazuli Bunting	LAZB
Le Conte's Sparrow	LCSP
Le Conte's Thrasher	LCTH
Least Bittern	LEBI
Least Flycatcher	LEFL
Least Sandpiper	LESA
Lesser Goldfinch	LEGO
Lesser Nighthawk	LENI
Lesser Prairie-Chicken	LEPC
Lesser Scaup	LESC
Lesser Yellowlegs	LEYE
Lewis's Woodpecker	LEWO
Lincoln's Sparrow	LISP
Loggerhead Shrike	LOSH
Long-billed Curlew	LBCU
Long-billed Dowitcher	LBDO
Long-eared Owl	LEOW
Lucy's Warbler	LUWA
MacGillivray's Warbler	MGWA

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Common Name	Code
Magnificent Hummingbird	MAHU
Magnolia Warbler	MAWA
Mallard	MALL
Marbled Godwit	MAGO
Marsh Wren	MAWR
McCown's Longspur	MCLO
Merlin	MERL
Mexican Chickadee	MECH
Mexican Jay	MEJA
Mexican Whip-poor-will	MWPW
Mississippi Kite	MIKI
Montezuma Quail	MONQ
Mountain Bluebird	MOBL
Mountain Chickadee	MOCH
Mountain Plover	MOPL
Mountain Quail	MOUQ
Mourning Dove	MODO
Mourning Warbler	MOWA
Nashville Warbler	NAWA
No Birds	NOBI
Northern Beardless-Tyrannulet	NBTY
Northern Bobwhite	NOBO
Northern Cardinal	NOCA
Northern Flicker	NOFL
Northern Flicker (Intergrade)	FLIN
Northern Flicker (Red-shafted)	RSFL
Northern Flicker (Yellow-shafted)	YSFL
Northern Goshawk	NOGO
Northern Harrier	NOHA

Common Name	Code
Northern Hawk Owl	NOHO
Northern Mockingbird	NOMO
Northern Parula	NOPA
Northern Pintail	NOPI
Northern Pygmy-Owl	NOPO
Northern Rough-winged Swallow	NRWS
Northern Saw-whet Owl	NSWO
Northern Shoveler	NSHO
Northern Waterthrush	NOWA
Olive Warbler	OLWA
Olive-sided Flycatcher	OSFL
Orange-crowned Warbler	OCWA
Orchard Oriole	OROR
Osprey	OSPR
Ovenbird	OVEN
Pacific Wren	PAWR
Pacific-slope Flycatcher	PSFL
Painted Bunting	PABU
Painted Redstart	PARE
Pectoral Sandpiper	PESA
Peregrine Falcon	PEFA
Phainopepla	PHAI
Pied-billed Grebe	PBGR
Pika	PIKA
Pileated Woodpecker	PIWO
Pine Grosbeak	PIGR
Pine Siskin	PISI
Pinyon Jay	PIJA
Plumbeous Vireo	PLVI

Common Name	Code
Prairie Falcon	PRFA
Prothonotary Warbler	PROW
Purple Martin	PUMA
Pygmy Nuthatch	PYNU
Pyrrhuloxia	PYRR
Red Crossbill	RECR
Red-bellied Woodpecker	RBWO
Red-breasted Merganser	RBME
Red-breasted Nuthatch	RBNU
Red-breasted Sapsucker	RBSA
Red-eyed Vireo	REVI
Red-faced Warbler	RFWA
Redhead	REDH
Red-headed Woodpecker	RHWO
Red-naped Sapsucker	RNSA
Red-necked Grebe	RNGR
Red-necked Phalarope	RNPH
Red-tailed Hawk	RTHA
Red-winged Blackbird	RWBL
Ring-billed Gull	RBGU
Ring-necked Duck	RNDU
Ring-necked Pheasant	RINP
Rock Pigeon	ROPI
Rock Wren	ROWR
Rose-breasted Grosbeak	RBGR
Ruby-crowned Kinglet	RCKI
Ruby-throated Hummingbird	RTHU
Ruddy Duck	RUDU
Ruffed Grouse	RUGR

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Common Name	Code
Rufous Hummingbird	RUHU
Rufous-crowned Sparrow	RCSP
Rufous-winged Sparrow	RWSP
Sage Thrasher	SATH
Sagebrush Sparrow	SAGS
Sandhill Crane	SACR
Savannah Sparrow	SAVS
Say's Phoebe	SAPH
Scaled Quail	SCQU
Scarlet Tanager	SCTA
Scissor-tailed Flycatcher	STFL
Scott's Oriole	SCOR
Sedge Wren	SEWR
Semipalmated Plover	SEPL
Sharp-shinned Hawk	SSHA
Sharp-tailed Grouse	STGR
Short-eared Owl	SEOW
Song Sparrow	SOSP
Sora	SORA
Spotted Owl	SPOW
Spotted Sandpiper	SPSA
Spotted Towhee	SPTO
Sprague's Pipit	SPPI
Spruce Grouse	SPGR
Squirrel, Abert's	ABSQ
Squirrel, Red	RESQ
Steller's Jay	STJA
Sulphur-bellied Flycatcher	SBFL
Summer Tanager	SUTA

Common Name	Code
Swainson's Hawk	SWHA
Swainson's Thrush	SWTH
Swamp Sparrow	SWSP
Tennessee Warbler	TEWA
Townsend's Solitaire	TOSO
Townsend's Warbler	TOWA
Tree Swallow	TRES
Tropical Kingbird	TRKI
Trumpeter Swan	TRUS
Turkey Vulture	TUVU
Unknown Accipiter	UNAC
Unknown Bird	UNBI
Unknown Blackbird	UNBL
Unknown Buteo	UNBU
Unknown Cardinal	UNCA
Unknown Chickadee	UNCH
Unknown Cormorant	UNCT
Unknown Corvid	UNCO
Unknown Cowbird	UNCB
Unknown Dove	UNDO
Unknown Duck	UNDU
Unknown Empidonax	UNEM
Unknown Falcon	UNFA
Unknown Finch	UNFI
Unknown Flicker	UNFR
Unknown Flycatcher	UNFL
Unknown Gnatcatcher	UNGN
Unknown Grouse	UNGR
Unknown Gull	UNGU

Common Name	Code
Unknown Hawk	UNHA
Unknown Hummingbird	UNHU
Unknown Jay	UNJA
Unknown Kingbird	UNKI
Unknown Longspur	UNLO
Unknown Meadowlark	UNME
Unknown Myiarchus	UNMY
Unknown Nuthatch	UNNU
Unknown Oriole	UNOR
Unknown Owl	UNOW
Unknown Quail	UNQU
Unknown Raptor	UNRA
Unknown Raven	UNRV
Unknown Sandpiper	UNSA
Unknown Sapsucker	UNSS
Unknown Sparrow	UNSP
Unknown Swallow	UNSW
Unknown Swift	UNSI
Unknown Tanager	UNTA
Unknown Thrasher	UNTR
Unknown Thrush	UNTH
Unknown Towhee	UNTO
Unknown Vireo	UNVI
Unknown Warbler	UNWA
Unknown Woodpecker	UNWO
Unknown Wren	UNWR
Upland Sandpiper	UPSA
Varied Bunting	VABU
Varied Thrush	VATH

Field Protocol for Spatially Balanced Sampling of Landbird Populations

Common Name	Code
Vaux's Swift	VASW
Veery	VEER
Verdin	VERD
Vermilion Flycatcher	VEFL
Vesper Sparrow	VESP
Violet-green Swallow	VGSW
Virginia Rail	VIRA
Virginia's Warbler	VIWA
Warbling Vireo	WAVI
Western Bluebird	WEBL
Western Flycatcher	WEFL
Western Grebe	WEGR
Western Kingbird	WEKI
Western Meadowlark	WEME
Western Sandpiper	WESA
Western Screech-Owl	WESO
Western Tanager	WETA
Western Wood-Pewee	WEWP

Common Name	Code
White-breasted Nuthatch	WBNU
White-crowned Sparrow	WCSP
White-crowned Sparrow (Gambel's)	GWCS
White-crowned Sparrow (Mountain)	MWCS
White-eared Hummingbird	WEHU
White-eyed Vireo	WEVI
White-faced Ibis	WFIB
White-tailed Ptarmigan	WTPT
White-throated Sparrow	WTSP
White-throated Swift	WTSW
White-winged Crossbill	WWCR
White-winged Dove	WWDO
Whooping Crane	WHCR
Wild Turkey	WITU
Willet	WILL
Williamson's Sapsucker	WISA
Willow Flycatcher	WIFL
Wilson's Phalarope	WIPH

Common Name	Code
Wilson's Snipe	WISN
Wilson's Warbler	WIWA
Winter Wren	WIWR
Wood Duck	WODU
Woodhouse's Scrub-Jay	WOSJ
Yellow Warbler	YEWA
Yellow-billed Cuckoo	YBCU
Yellow-breasted Chat	YBCH
Yellow-eyed Junco	YEJU
Yellow-headed Blackbird	YHBL
Yellow-rumped Warbler	YRWA
Yellow-rumped Warbler (Audubon's)	AUWA
Yellow-rumped Warbler (Myrtle)	MYWA
Yellow-throated Vireo	YTVI
Yellow-throated Warbler	YTWA
Zone-tailed Hawk	ZTHA