Field Protocol for Spatially Balanced Sampling of Landbird Populations

Integrated Monitoring in Bird Conservation Regions (IMBCR)

Updated April 2020

Bird Conservancy of the Rockies

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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Canyon Wren by Bill Schmoker. Used with permission.

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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 in 2008. 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, private property, 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 files 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.birdconservancy.org/

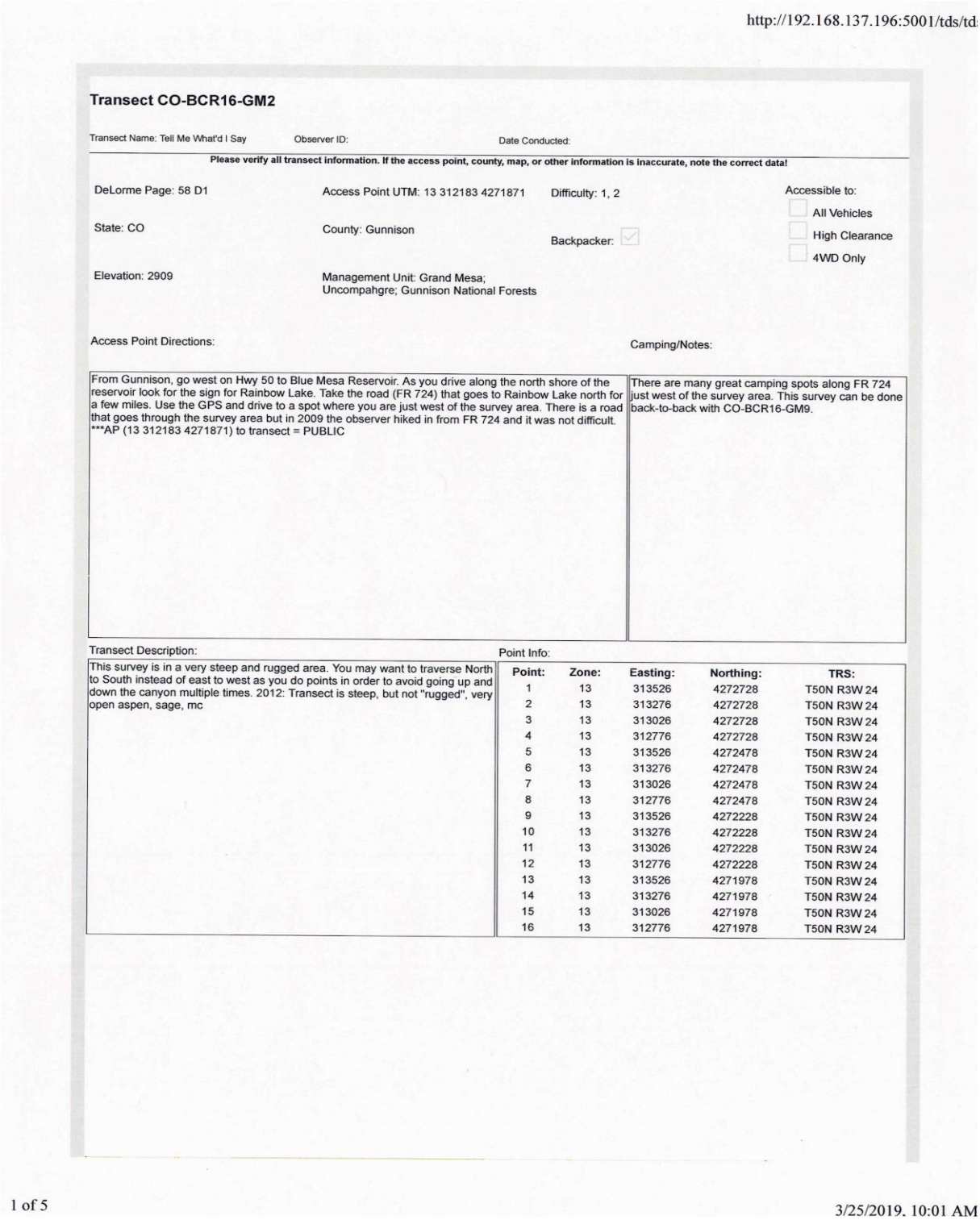
You will be required to login using the username and password provided to you at training. Once logged into the site, select the "Transect Description Sheets" link. In the box provided, type in the name of the survey you want to look at (i.e. AZ-BCR34-CF1), make sure just the "Show Maps" box is checked, and hit "Generate Transect Description Sheets". All survey 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 survey and among 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 surveys 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 as safe for travel.

B. Google Earth files

Prior to training you will receive a Google Earth file with surveys 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 (https://www.google.com/earth/versions/ - select Google Earth Pro on Desktop). Once Google Earth is installed you can double click on the KML file sent to you and view the survey locations in Google Earth. This file will help you plan the order you would like to conduct your assigned surveys to minimize travel time and distance traveled 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 survey that has been assigned to you. If you are missing a transect description sheet you can print one by visiting the transect description site (Transect Description Sheets), logging in with your username and password, and entering the full survey name. If you would like to include the landowner information sheet (Figure 3) 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 survey that has not been completed before and does not have any information. 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:



http://192.168.137.196:5001/tds/td

Transect CO-BCR16-GM2

Transect Name: Tell Me What'd I Say Observer ID: Date Conducted:

Please verify all transect information. If the access point, county, map, or other information is inaccurate, note the correct data!

DeLorme Page: 58 D1

Access Point UTM: 13 312183 4271871

Difficulty: 1, 2

Accessible to:
- All Vehicles
- High Clearance
- 4WD Only

State: CO

County: Gunnison

Backpacker:

Elevation: 2909

Management Unit: Grand Mesa; Uncompahgre; Gunnison National Forests

Access Point Directions:

From Gunnison, go west on Hwy 50 to Blue Mesa Reservoir. As you drive along the north shore of the reservoir look for the sign for Rainbow Lake. Take the road (FR 724) that goes to Rainbow Lake north for a few miles. Use the GPS and drive to a spot where you are just west of the survey area. There is a road that goes through the survey area but in 2009 the observer hiked in from FR 724 and it was not difficult. ***AP (13 312183 4271871) to transect = PUBLIC

Camping/Notes:

There are many great camping spots along FR 724 just west of the survey area. This survey can be done back-to-back with CO-BCR16-GM9.

Transect Description:

This survey is in a very steep and rugged area. You may want to traverse North to South instead of east to west as you do points in order to avoid going up and down the canyon multiple times. 2012: Transect is steep, but not "rugged", very open aspen, sage, mc

Point Info:

Point:	Zone:	Easting:	Northing:	TRS:
1	13	313526	4272728	T50N R3W 24
2	13	313276	4272728	T50N R3W 24
3	13	313026	4272728	T50N R3W 24
4	13	312776	4272728	T50N R3W 24
5	13	313526	4272478	T50N R3W 24
6	13	313276	4272478	T50N R3W 24
7	13	313026	4272478	T50N R3W 24
8	13	312776	4272478	T50N R3W 24
9	13	313526	4272228	T50N R3W 24
10	13	313276	4272228	T50N R3W 24
11	13	313026	4272228	T50N R3W 24
12	13	312776	4272228	T50N R3W 24
13	13	313526	4271978	T50N R3W 24
14	13	313276	4271978	T50N R3W 24
15	13	313026	4271978	T50N R3W 24
16	13	312776	4271978	T50N R3W 24

1 of 5

3/25/2019, 10:01 AM

Figure 1. Example Transect Description Sheet

1. Observer ID
Record your observer ID here.

2. Date Conducted (YYYY/MM/DD)
Record the date you complete the survey.

3. DeLorme Page
Record the Delorme page number and section identification (e.g. B4) for the survey location. This allows future field technicians to quickly locate the survey location on the road map.

4. Access Point UTMs
The UTMs and projection zone for the closest spot to the survey where a surveyor can park their vehicle.

5. Access and Transect Difficulty
It is helpful to have an idea of what to expect before surveying a grid. Some surveys 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	**Survey 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 the grid requires less than 45 minutes.
2: 3 km - 6 km with relatively easy topography. Hike to the grid requires less than 75 minutes.
3: ≥6 km and/or difficult terrain. Grid likely requires backpacking into the survey location the day before.
4: Grid is inaccessible due to river, cliffs, or other dangerous terrain.

Survey Difficulty (Measure of the difficulty traveling between points on a survey):
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 survey. 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.

6. Transect Accessible to
Please record what type of vehicle is required to drive to the access point (all vehicles, high-clearance, or 4WD). It is important for crew leaders to know the accessibility of each survey so they can assign surveys to field technicians with appropriate vehicles.

7. Backpacker
Check this box if the survey requires two or more days to complete and requires at least one full day to backpack into the survey location.

8. Directions to Access Point
Each survey should have an Access Point which is the most logical and efficient location to park a vehicle to access the survey. The Access Point directions are the driving directions to this point. 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. It can also be helpful to record UTM coordinates of intersections or other landmarks if the access route includes a travel and navigation on small unmarked roads. For all sites, record the UTM coordinates for each Access Point. It can be helpful to make the Access Point a recognizable feature on the landscape, such as a cattle guard or sign post.

It is also helpful to record the directions and hiking time from the access point to the survey. Record distance in meters and time required to hike from the access point to the first point of the survey. Record detailed directions for hiking from the access point to the first point of the survey if necessary. Record UTM coordinates of landmarks or locations that are important for accessing the survey in the most efficient way possible (e.g. where to leave a hiking trail and start bushwhacking). As some of these grids are miles from the nearest road, explicit details of a good route to the survey will help future technicians immensely.

Review the access point and hiking directions for all surveys and update the information if needed. If a previous technician recorded directions that do not make sense or are incorrect please delete the old directions. If you find an alternate route, but both sets of directions are still useful keep both sets of directions with one labeled “Alternate Directions”.

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

9. Camping Information and Notes
Please provide directions to, and a description of, camping options in the area including UTM coordinates. If camping is unavailable near the survey (e.g., the survey is surrounded by private land and there is not public land in the area) then record where you stayed. The nearest library or

free internet location is often helpful information as well. You can also record 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 survey as this can bias future detection data.

10. Transect description
Record the primary habitat types encountered, information about the terrain, fence or stream crossings, and any other information that would be helpful to know while surveying. For difficult surveys, it may be helpful to provide directions between points or an exact order to conduct the points to avoid/limit difficult navigation.

D. Delorme, BLM, and USFS Maps

Delorme maps are useful for driving directions in your study area and locating towns, public lands, or other areas of interest in the general area. Surveys on BLM lands or National Forests may be greatly aided by maps produced by those agencies. In particular, we recommend having USFS or BLM maps that display trail systems, 4WD roads, and parking areas for backcountry surveys as these can greatly simplify navigation to the survey. 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

A. Ownership Categories

Land ownership is determined prior to the beginning of the field season. Technicians are responsible for determining public or granted access routes to survey locations. 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 ownership encountered while conducting surveys:

- **Public Right-of-Way (PRW)**: 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 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 local 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 specific 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 trust lands, whereas in North Dakota, the public may access school trust lands without prior consent. State resource lands almost always require passes or permits. Each crew leader is responsible for obtaining the necessary permits and giving you the regulations that must be followed for surveying on state lands. If you are not sure if you have the necessary permits and/or information for a survey on state land contact your supervisor.

- **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 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 and give them to you before you conduct the survey. Your employer will reimburse you for any fees or permit 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 areas with BLM lands, but may 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.

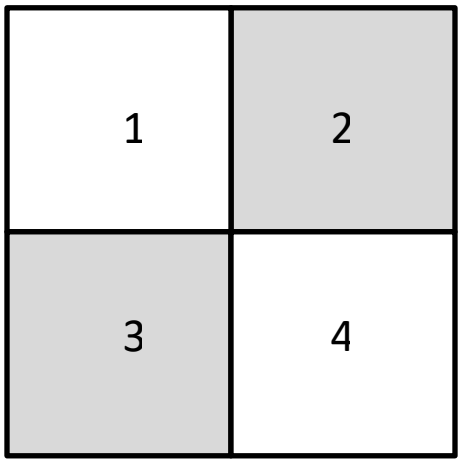


Figure 2. Representation of "checkerboard" landscape. Shaded squares represent private parcels and un-shaded squares represent public parcels.

B. 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 survey 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: https://fc.birdconservancy.org/Default.aspx 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 and survey map sheet (Figure 3 and Figure 4). Points where the access status is listed as "no contact" or "unknown" should not be marked. This will help you 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 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).

Name:	Jennifer Blakesley	5, 9, 13,
Address:	1230 Mountain Vista St., Green River, WY 82935	
Phone:	(307) 332-0835	
Name:	Jeff Birek (owner)	1,
Business:	Birek Cattle Co. LLC	
Address	PO Box 247	
	Green River, WY 82935	
Phone:	(307) 331-4251	
Alternate Phone:	(307) 328-4455	
Name:	Green Grass Country Club (Owner), Nick Van Lanen (Contact)	10, 11, 14
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.	
Name:	Chris White (owner)	2, 4,
Address	PO Box 844	
	Green River, WY 82935	
Physical Address:	2716 Tulane Dr.	
Phone:	(307) 452-9845	
Name:	Jora Rehm-Lorber (owner)	6, 7, 8,
Address	589 Comanche Cir	
	Green River, WY 82935	
Phone:	(307) 362-3854	
Name:	Matthew & Cassidy McLaren (owner)	12, 15, 16
Address	1100 Mountain Vista St.	
	Green River, WY 82935	
Phone:	(307) 462-8985	
Name:	David Hanni (owner)	3,
Address	PO Box 1441	
	Green River, WY 82935	
Phone:	(307) 433-9957	

Figure 3. Example landowner information sheet

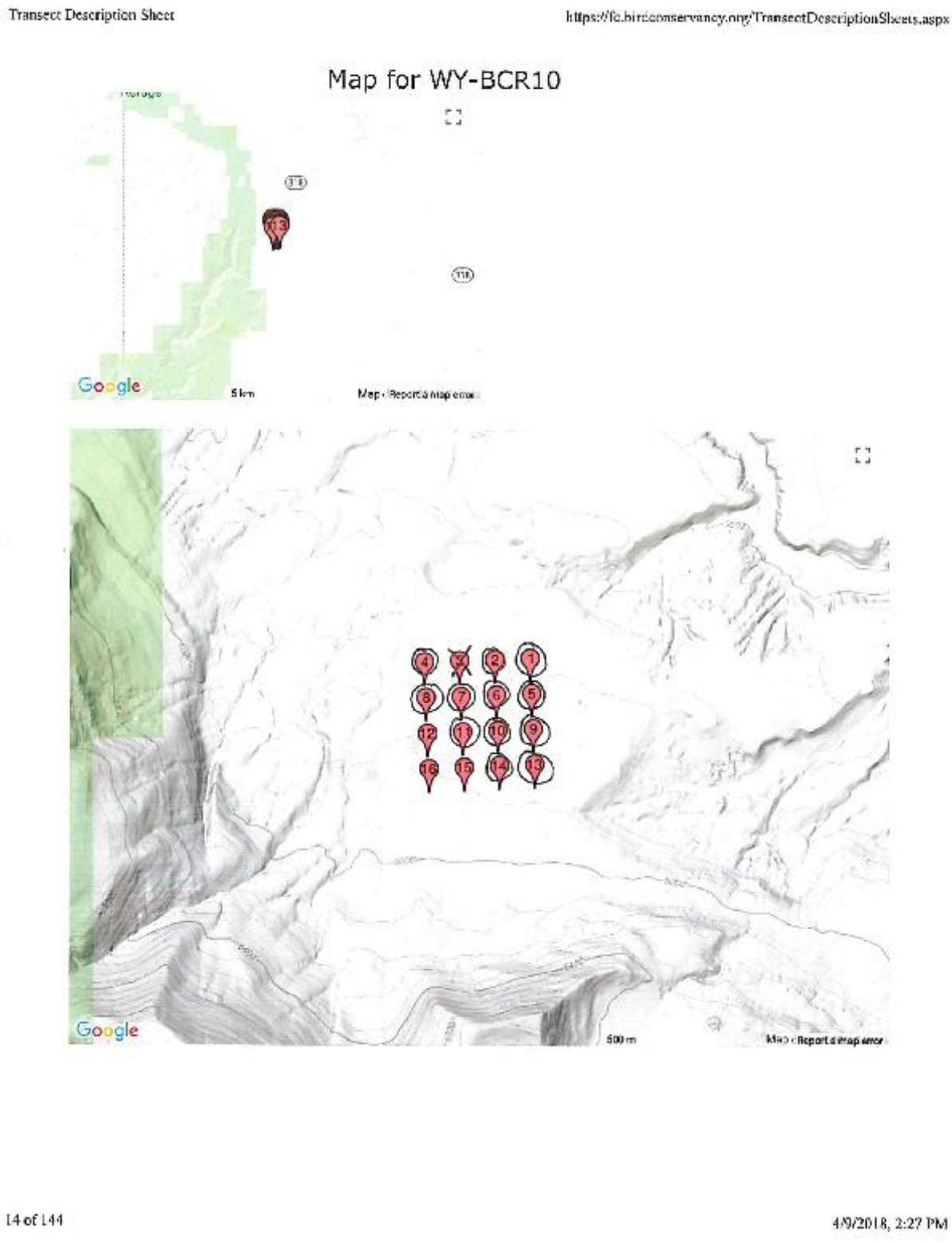


Figure 4. Example survey map

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 Blakesly	courtesy	granted	1	NO
Notes: Left a massage 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 5. 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 the day before conducting the survey during the daylight. This will make it easier to navigate to the first point if you have to hike to the survey location 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 location.

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.

D. Daily Timing

Sampling will occur in the morning, beginning approximately ½ 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 depending on location and date and you should check the local sunrise time using your GPS. You should 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 talk to your crew leader and review the safety protocol provided to you by the organization you work for. 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 many IMBCR partners provide, SPOT (Satellite Personal Tracker) or inReach units for each individual conducting field work. SPOT and inReach units are a way for technicians to regularly check in with their crew leader 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. Most IMBCR partner organizations require field technicians to send their crew leader an "ok" message prior to, and following, the completion of each survey.

This assures the crew leader that technicians are able to safely get into and out of their surveys on a daily basis. The nature of this form of contact requires the regular and consistent use of the units; otherwise, the 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

California:
May 20 – June 20

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

Nevada:
<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

New Mexico (entire state):
April 15 – May 31

North Dakota (entire state):
June 1 - June 26

Oklahoma (entire state):
April 20 – June 15

Oregon:
May 20 – June 20

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 surveys 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 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 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 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 50 m 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 plastic bag), or take photos 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. 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. Transect ID: Enter the full character code identifying the state, stratum and survey 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 survey.

d. Time: (start and end) Enter start and end times in military time for the entire transect using the local 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.

e. Sky: (start and end): Enter a one-digit code from below at beginning and end of the survey (not for each point). The codes you should use are as follows:

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!

f. Wind: (start and end)**:** Enter a one-digit code from below at beginning and end of the survey:

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!

g. Temperature: (start and end)**:** Record the temperature in °F. If you do not have a thermometer estimate to the nearest 5°.

2. Point Info (Y/N)

a. Private Property: Enter "Y" for yes and "N" for no for each point.
b. Midstory Present: Record either "Y" or "N" to indicate the presence of several distinct layers of overstory vegetation.
c. 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.
d. 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".
e. 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.
f. 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.

3. Primary Habitat

Enter a two-letter code from below which corresponds to the primary habitat type that best describes the 50m radius surrounding the point.

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 ≥10% and consist of ≥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 ≤5% overstory and often lack a significant shrub component. Ground cover consists of short grasses (generally ≤10cm in height), wild flowers, mosses, lichens, and succulents.
d. **Barren (BA):** area with little vegetation or rock present. These areas are typically characterized by large amounts of gravel, sand, silt, clay, or other earthen material and tend

to be eroded. May include sand dunes, buttes, badlands formations, gravel pits, and desert pavement. The sum of live and dead grass must account for <10% of ground cover and shrub cover should be <10%. Exposed rock and boulders must make up <20% of ground cover (see Cliff/Rock). Barren habitat should not experience significant seasonal flooding (see Playa).

e. **Burned Area (BU):** forest habitat where ≥50% of canopy is dead and shows evidence of severe fire scars or where ≥50% of trees have burned and fallen.
f. **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 ≤10% shrub cover and <10% canopy cover. Bare rock should make up ≥20% of the exposed ground cover.
g. **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 ≤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 ≤20% of ground cover (see Shrubland).
h. **Deciduous Woodland (DW):** habitat consisting of ≥10% canopy cover that is dominated by deciduous species other than Aspen or Oak species. Native deciduous species should comprise ≥50% of the canopy cover and Aspen or Oak spp. must comprise ≤50% of the canopy cover. The 50m radius should not include a permanent or seasonal water source (see Riparian).
i. **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 ≥10%.
j. **Hemlock (HE):** habitat consisting of ≥ 10% canopy cover where hemlock species ≥50% of the overstory cover. Hemlock species include western hemlock and mountain hemlock.
k. **Herbaceous Meadow (HM):** Area with little to no overstory dominated by forbs, often surrounded by or interspersed within grassland habitat. Canopy cover should be ≤10%. Shrub layer should be ≤10%. Sum of live and dead standing grass should be <10%, and herbaceous should be ≥10%.
l. **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.
m. **Insect Infested (II):** forested habitat with ≥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 ≥10%.
n. **Jeffrey Pine (JP):** areas with ≥5% overstory cover that is made up primarily of Jeffrey pine. This habitat often includes other tree types such as fir and Ponderosa pine, but Jeffrey pine should comprise ≥50% of the overstory layer. Shrub cover can vary from sparsely to heavily vegetated. Ground cover typically dominated by grass species.
o. **Larch (LA):** overstory dominated by larch although other coniferous and deciduous species may be present. The overstory cover should be ≥10% and consist of ≥50% larch.
p. **Logged (LO)**: area within a forested habitat that has been recently logged. Overstory cover should be ≤10% (see a variety of forest primary habitats). Shrub cover should be ≤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.

q. **Lodgepole Pine (LP):** habitat consisting of ≥10% canopy cover that is dominated by lodgepole pine. Canopy may have other conifer species or some aspen, but lodgepole pine must comprise ≥50% of the overstory cover. Shrub layer can be conspicuous or nearly absent.
r. **Mesquite Bosque (MB):** forested habitat surrounding riparian corridors that consists of ≥50% mesquite species. Canopy cover should be ≥10%. Ground cover typically consists primarily of grasses.
s. **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 ≥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.
t. **Montane Meadow (MM):** areas with little to no overstory that are surrounded by forests. Elevations should be ≥7,000'. Soils should be moist to wet with forbs or grass as the dominant ground cover. Canopy cover should be ≤10%. Shrub layer should be ≤10%.
u. **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 ≥10% cover, with oak species making up ≥50% of that cover. In some instances there may be little or no overstory because the Oak species that are present are <3m high. In southern Arizona this habitat code should be used for Madrean woodlands.
v. **Open Water (OW):** habitat consisting of ≥50% open water, bank, and shoreline. Any other habitat type may be present, but must be <50%.
w. **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 ≥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 <3m high.
x. **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.
y. **Ponderosa Pine (PP):** areas with ≥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 ≥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.
z. **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.

aa. **Sage Shrubland (SA):** habitat where grasses and shrubs are co-dominant and the shrub cover is ≥10%. Shrub species must consist of ≥30% sagebrush. Typical ground cover is dominated by grasses with limited forbs and bare ground.

bb. **Spruce-Fir (SF):** coniferous forest that is dominated by spruce and fir species (typically occurring at elevations ≥7000'). Note that Douglas-fir is not a true fir species (see Mixed Conifer). Overstory cover should be ≥10% with spruce and fir species comprising ≥50% of the overstory cover. Variable understory typically includes shrubs and forbs with few grasses.

cc. **Shrubland (SH):** landscape co-dominated by grass and shrub species. Shrub cover must be ≥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 ≥20% of ground cover (see Desert/Semi desert Shrubland).

dd. **Urban/Residential (UR):** areas highly impacted by human development in which ≥20% of the ground is covered by impermeable surfaces. Typically describing relatively dense development including houses, lawns, sidewalks, parking areas, and streets.

ee. **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 ≤10%.

ff. **Whitebark Pine (WP):** mid to high elevation habitat (>6,000') dominated by whitebark pine. The overstory cover should be >5% and consist of >50% whitebark pine.

gg. **Western Red Cedar (WR):** habitat consisting of ≥10% canopy cover that is dominated by western cedar species including western red cedar, incense cedar, and Alaska cedar. Canopy may have other conifer or deciduous species, but cedar species must comprise ≥50% of the overstory cover.

hh. **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.

4. Overstory Data

Woody vegetation 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 7 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 ≥3m 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+) and the snags are fairly evenly distributed within the 50m radius 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 x 4). Please take the time to count all snags within the 50m radius whenever possible and never record 100+, 200+, etc.

d. **Species Composition:** Identify the dominant tree species in the overstory and record the relative abundance (%) of the total overstory occupied by each species within a 50m radius of each point count station; you can list up to five species. Record overstory 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 the % overstory cover.

   Note that snags (SN), dead trees (DA, DC, DD, DJ, DY), and burned trees (BC or BU) should be considered part of the overstory species composition if they are ≥3m 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 or Notes box 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 XX_1, XX_2, 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).

5. Understory Data

Use this category to estimate the percent cover and species makeup of any woody vegetation (including seedling trees) that is ≥0.25m high and <3.0m high. Woody vegetation shorter than 0.25m should be considered part of the "woody" 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 the applicable row for the point in the Understory Layer section.

a. **Understory Cover:** Estimate the total percent coverage of all woody understory 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 7 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 (DA, DC, or DD, DJ, DY), and burned trees (BC or BU) should be considered part of the understory species composition if they are ≥0.25m and < 3m tall but should not be included in the number of snags you recorded earlier.

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 XX_1, XX_2, 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 or UD for unknown deciduous, or OT for other).

6. Ground Cover Data

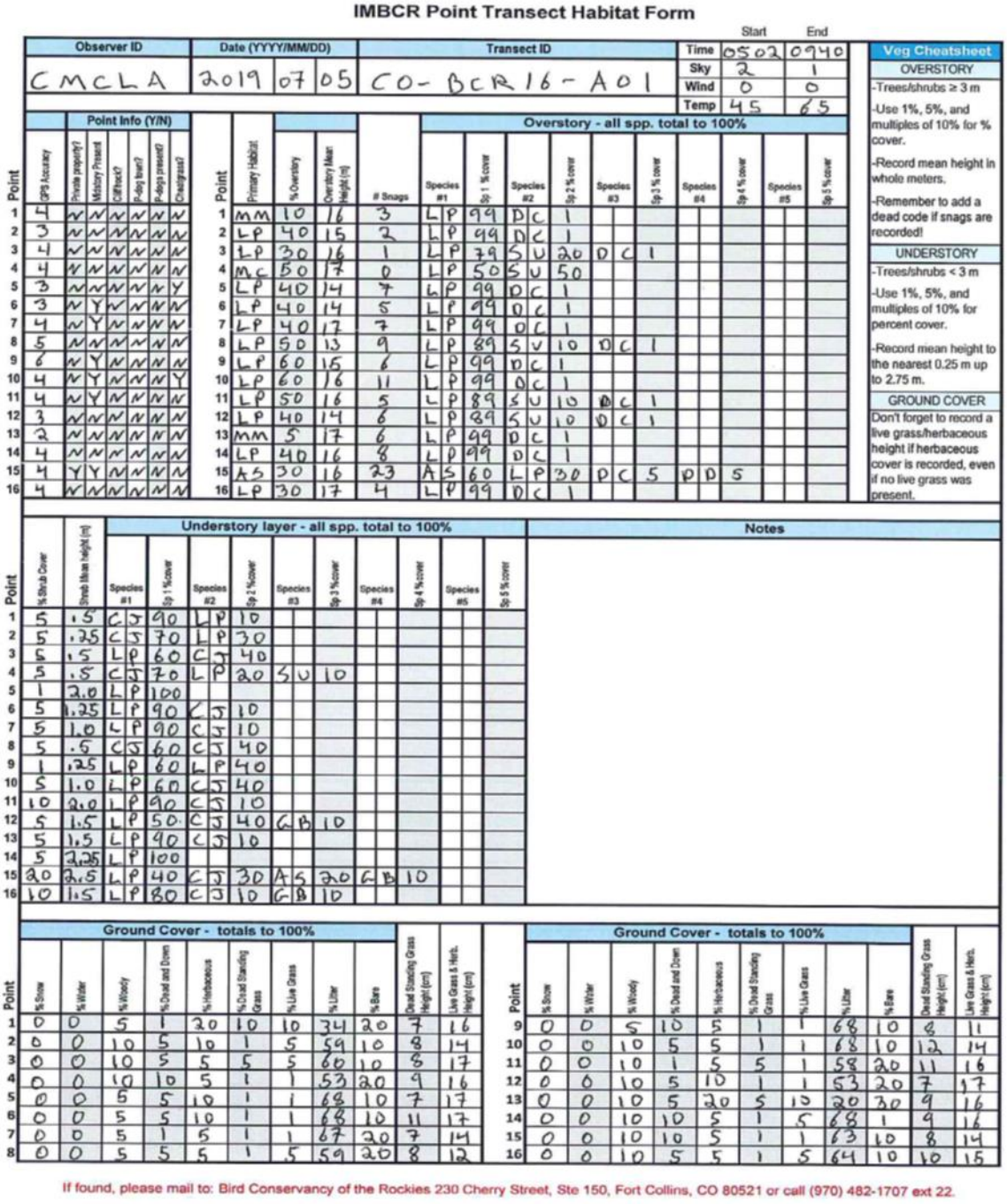
We classify ground cover into nine categories. For each of the below categories, estimate the total percent of ground cover category within 50m of the count station. Use 1%, 5%, or multiples of 10% when estimating % ground cover. It is acceptable for the largest ground cover value to be something other 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 live grass. Please note, the live grass height represents the mean height for live grass **and** herbaceous vegetation.

a. **Snow;**
b. **Water;**
c. **Woody:** vegetation below 0.25m (roughly 10 inches) including cacti;
d. **Dead and down:** trees (with a minimum of 6" diameter) which do not reach 0.25m tall at their highest point;
e. **Herbaceous:** broad-leaved herbaceous plants and forbs;
f. **Dead standing grass:** includes grass, rushes, reeds, and sedges that are no longer alive and are clearly from the previous year's growing season;
g. **Live grass:** includes grasses, rushes, reeds, and sedges that are still green or are from this year's growing season. Note: wheat is a grass and should be included in % live grass cover;
h. **Litter:** % of ground covered by any type of organic litter such as, leaves, needles, bark, dead grass, and all woody debris with a diameter <6";
i. **Bare:** % of ground covered by inorganic materials such as dirt, rocks, pavement and sand;
j. **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;

k. **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 can use your datasheet (21.5cm x 28cm) or pencil (15cm) to help you estimate.

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.



IMBCR Point Transect Habitat Form

Observer ID	Date (YYYY/MM/DD)	Transect ID		Start	End
CMCLA	2019 07 05	CO-BCR16-A01	Time	0502	0940
			Sky	2	1
			Wind	0	0
			Temp	45	65

Veg Cheatsheet

OVERSTORY
-Trees/shrubs ≥ 3 m
-Use 1%, 5%, and multiples of 10% for % cover.
-Record mean height in whole meters.
-Remember to add a dead code if snags are recorded!

UNDERSTORY
-Trees/shrubs < 3 m
-Use 1%, 5%, and multiples of 10% for percent cover.
-Record mean height to the nearest 0.25 m up to 2.75 m.

GROUND COVER
Don't forget to record a live grass/herbaceous height if herbaceous cover is recorded, even if no live grass was present.

Point	GPS Accuracy	Point Info (Y/N): Private property?	Mystery Present	Offtrack?	P-dog town?	P-dogs present?	Cheatgrass?	Point	Primary Habitat	%Overstory	Overstory Mean Height (m)	# Snags	Overstory - all spp. total to 100%: Species #1	Sp 1 %cover	Species #2	Sp 2 %cover	Species #3	Sp 3 %cover	Species #4	Sp 4 %cover	Species #5	Sp 5 %cover
1	4	N	N	N	N	N	N	1	MM	10	16	3	LP	99	DC	1						
2	3	N	N	N	N	N	N	2	LP	40	15	2	LP	99	DC	1						
3	4	N	N	N	N	N	N	3	LP	30	16	1	LP	79	SU	20	DC	1				
4	4	N	N	N	N	N	N	4	MC	50	17	0	LP	50	SU	50						
5	3	N	N	N	N	N	Y	5	LP	40	14	7	LP	99	DC	1						
6	3	N	Y	N	N	N	N	6	LP	40	14	5	LP	99	DC	1						
7	4	N	Y	N	N	N	N	7	LP	40	17	7	LP	99	DC	1						
8	5	N	N	N	N	N	N	8	LP	50	13	9	LP	89	SU	10	DC	1				
9	6	N	Y	N	N	N	N	9	LP	60	15	6	LP	99	DC	1						
10	4	N	Y	N	N	N	Y	10	LP	60	16	11	LP	99	DC	1						
11	4	N	Y	N	N	N	N	11	LP	50	16	5	LP	89	SU	10	DC	1				
12	3	N	N	N	N	N	N	12	LP	40	14	6	LP	89	SU	10	DC	1				
13	2	N	N	N	N	N	N	13	MM	5	17	6	LP	99	DC	1						
14	4	N	N	N	N	N	N	14	LP	40	16	8	LP	99	DC	1						
15	4	Y	Y	N	N	N	N	15	AS	30	16	23	AS	60	LP	30	PC	5	PD	5		
16	4	N	N	N	N	N	N	16	LP	30	17	4	LP	99	DC	1						

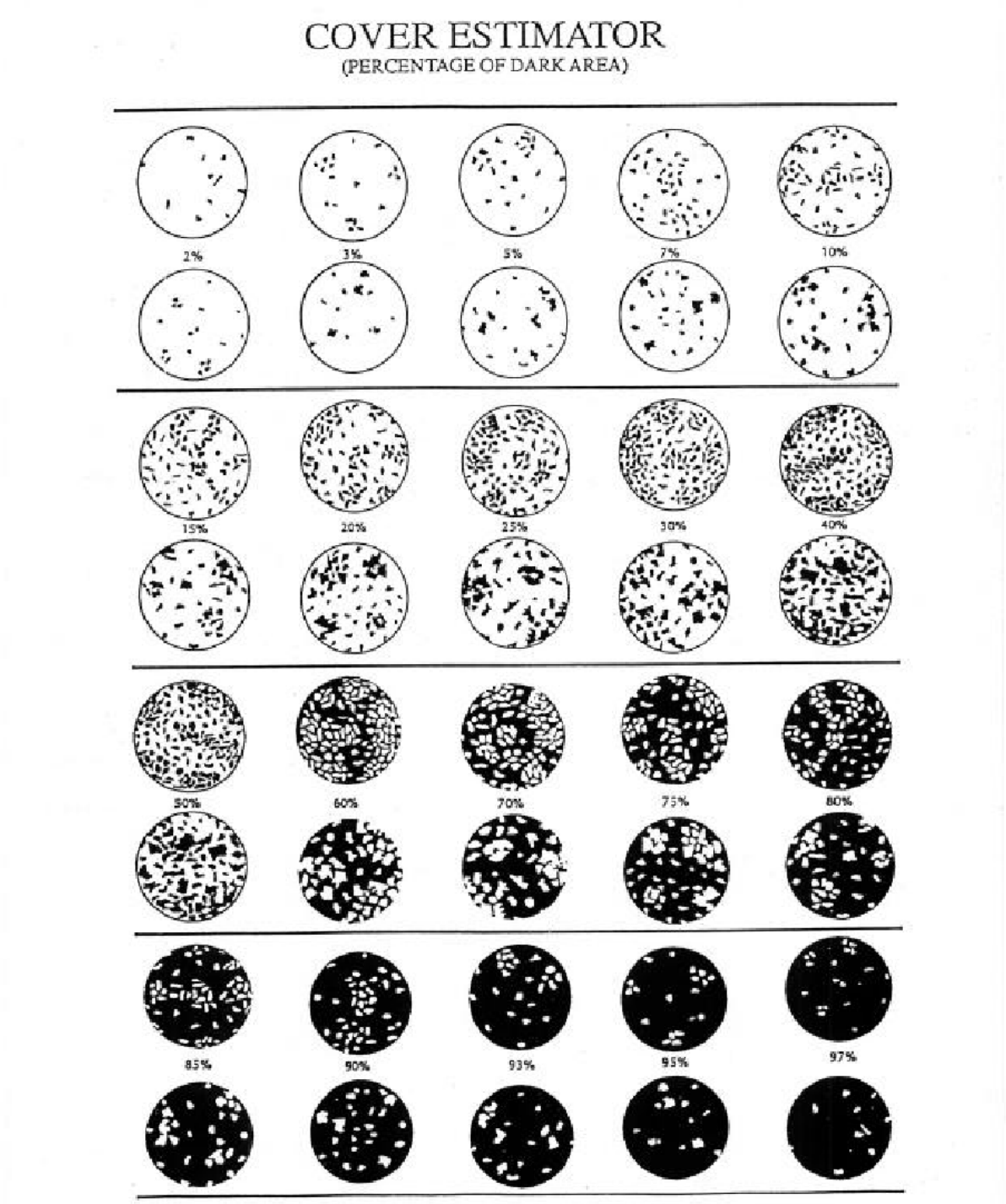
Point	% Shrub Cover	Shrub Mean Height (m)	Understory layer - all spp. total to 100%: Species #1	Sp 1 %cover	Species #2	Sp 2 %cover	Species #3	Sp 3 %cover	Species #4	Sp 4 %cover	Species #5	Sp 5 %cover	Notes
1	5	.5	CJ	90	LP	10							
2	5	.25	CJ	70	LP	30							
3	5	.5	LP	60	CJ	40							
4	5	.5	CJ	70	LP	20	SU	10					
5	1	2.0	LP	100									
6	5	1.25	LP	90	CJ	10							
7	5	1.0	LP	90	CJ	10							
8	5	.5	CJ	60	CJ	40							
9	1	.25	LP	60	LP	40							
10	5	1.0	LP	60	CJ	40							
11	10	2.0	LP	90	CJ	10							
12	5	1.5	LP	50	CJ	40	GB	10					
13	5	1.5	LP	90	CJ	10							
14	5	2.25	LP	100									
15	20	2.5	LP	40	CJ	30	AS	20	GB	10			
16	10	1.5	LP	80	CJ	10	GB	10					

Point	Ground Cover - totals to 100%: % Snow	% Water	% Woody	% Dead and Down	% Herbaceous	% Dead Standing Grass	% Live Grass	% Litter	% Bare	Dead Standing Grass Height (cm)	Live Grass & Herb. Height (cm)
1	0	0	5	1	20	10	10	34	20	7	16
2	0	0	10	5	10	1	5	59	10	8	14
3	0	0	10	5	5	5	5	60	10	8	17
4	0	0	10	10	5	1	1	53	20	9	16
5	0	0	5	5	10	1	1	68	10	7	17
6	0	0	5	5	10	1	1	68	10	11	17
7	0	0	5	1	5	1	1	67	20	7	14
8	0	0	5	5	5	1	5	59	20	8	12

Point	Ground Cover - totals to 100%: % Snow	% Water	% Woody	% Dead and Down	% Herbaceous	% Dead Standing Grass	% Live Grass	% Litter	% Bare	Dead Standing Grass Height (cm)	Live Grass & Herb. Height (cm)
9	0	0	5	10	5	1	1	68	10	8	11
10	0	0	10	5	5	1	1	68	10	12	14
11	0	0	10	1	5	5	1	58	20	11	16
12	0	0	10	5	10	1	1	53	20	7	17
13	0	0	10	5	20	5	10	20	30	9	16
14	0	0	10	10	5	1	5	68	1	9	16
15	0	0	10	10	5	1	1	63	10	8	14
16	0	0	10	5	5	1	5	64	10	10	15

If found, please mail to: Bird Conservancy of the Rockies 230 Cherry Street, Ste 150, Fort Collins, CO 80521 or call (970) 482-1707 ext 22.

Figure 6. Example of a completed Vegetation Datasheet



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

Figure 7. Examples of percent cover

E. Point Information Datasheet

On the back of the vegetation datasheet there is a list of points and a space to enter the reasons points were not completed (Figure 8). 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, 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).

Code	Description
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 (5 hours past sunrise or noticeably decreased bird activity)
O	Other - explain

You may run into other unexpected issues in the field which prevent 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 report this information to our funders after the field season, so the more information you provide, the less your crew leader will contact you with questions after the field season.

Point	Reasons points were not conducted. If O, provide an explanation below.
1	
2	
3	O: Pt. on public land, 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 ID	Year	Transect ID
CMCLA	2019	CO-BCR16-A01

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.
Most	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 (five hours past sunrise or noticeably decreased bird activity)
Least	O: Other - explain

Figure 8. 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 every bird datasheet. If a bird form does not have this information and it becomes separated from the vegetation datasheet, then there is no way to know what survey 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:

a. Observer: Fill in your unique login on all pages of the bird form.
b. Date: Record the date you are conducting the survey (MM/DD/YY).
c. 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.
d. Page number: Fill in the page number associated with the bird data. Please count each side of a datasheet as one page.

2. Point Data

Enter the number of the point (01-16) 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 of the local time of the time zone you are in.

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.

**Important notes for conducting IMBCR point counts:

a. It is extremely important to document the minute of the count that an individual bird was first detected. Your crew leader will provide 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 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. To record the minute interval associated with each detection, 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.
b. If you do not detect any birds during a minute interval, record "NOBI" (No Birds) for that minute interval. 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 these data will reflect that you did conduct a full six minute count.
c. 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 distance from the

survey point to where the bird flushed from, because we assume that these birds would have remained at their original locations were it not for the disturbance created by the observer.

d. 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.

e. 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.

f. 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.

g. 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!

h. 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 the bird was first detected**
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 9 at the end of this section for an example of a completed bird datasheet.

3. Start time
Record the start time in the local 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 grid you are about to survey. Indicate the start of a new point by leaving a blank line on the datasheet 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. 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 beep each minute to let you know when the next minute interval has begun.

6. Species
All birds detected during the six-minute count period should be recorded using the correct four-letter codes. If you 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. Make sure to update these records and include correct 4 letter codes for all detections before submitting data sheets to your crew leader. See Appendix C. Four-Letter Bird Codes for a complete list of bird species codes. Please commit to memory codes that do not follow the general code convention.

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 Owl** (BNOW not BAOW), **Barred Owl** (BDOW not BAOW), **Western Wood-Pewee** (WEWP, not WWPE), **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), **Sagebrush Sparrow** (SABS 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. To ensure consistency across the IMBCR program we only record subspecies if you are able to visually identify an individual to subspecies. Do not record subspecies based on calls or songs even if you feel that you are able to identify them by call or song (i.e., you need to visually identify individuals to subspecies). For subspecies use the four letter codes listed below.

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
Mallard (Mexican Duck)	MEDU	Yellow-rumped Warbler (Myrtle's)	MYWA

If you detect a bird that you are unable to identify, use the appropriate unknown bird code from the list below. Never guess on the identity of a bird. This is falsifying data. If you are unsure, we would prefer you 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 more before performing additional point counts.

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

7. Distance

Using your rangefinder, measure the distance from the point count station to 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 (1000 m) 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 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 pinpoint 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 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 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.

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 Code

"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. If you have on line with multiple individuals do not use a Cluster Code.

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: During the first minute of a point count the observer hears a Western Tanager (WETA) and an American Robin (AMRO) singing, after the timer beeps the observer hears a Black-headed Grosbeak (BHGR) give its distinctive squeaky call note. The observer turns to see the bird and notes that the calling bird is a male BHGR 27m away AND also notes that there is a female BHGR in the same tree, but about 29m away. The observer then sees an Audubon's Warbler 47m away and later hears it sing. In minute three, the observer hears 5 Pine Siskins (PISI), looks up, and measures that they are 36-38m away. The observer does not record any new birds in minute 4. During the fifth minute 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 method of detection differs so they should be recorded on separate lines with a common cluster code). The observer sees a brown-plumaged CAFI in a tree 36m away in minute 6 (male CAFI require two years to achieve adult plumage, thus a brown-plumaged bird cannot be sexed in the field).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
			AUWA	47	V/S	U	X		1	
		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	CAFI	36	V	U	X		1	

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 area.

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 survey. In order to ensure that the detection occurred on the survey grid, you should only record "88 Birds" after completing the first point count and before beginning the last point count of the morning. Do not record "88" birds that you detect while approaching the survey 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. Survey 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 important to make notes about rare or unusual birds because after the field season, crew leaders 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 confirm your detection. Useful notes regarding a rare species 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. Reviewing data sheets

It is important to catch and correct as many errors in data collection as possible. The best way to catch errors is to review your datasheets both during and after each survey. For this reason please take the time to review your datasheets at each of the following times.

a. The first chance to catch and correct errors is immediately after completing each point count. Upon completing a six minute count you should briefly look over your datasheets and make sure that no fields were left blank and that everything is legible. Catching an error at this point provides the best opportunity to correct it. For example, if you forget to record the distance to a bird, you may be able to remember where you observed it and measure and fill in the missing distance before leaving the point. However, once you leave the point the missing information cannot be filled in accurately and any missing distances should be left blank.

b. You should carefully review all datasheets after completing the survey and before leaving the transect location. This will give you another chance to correct some errors that cannot be corrected after leaving the survey location (e.g. forgetting to record the access point UTMs).

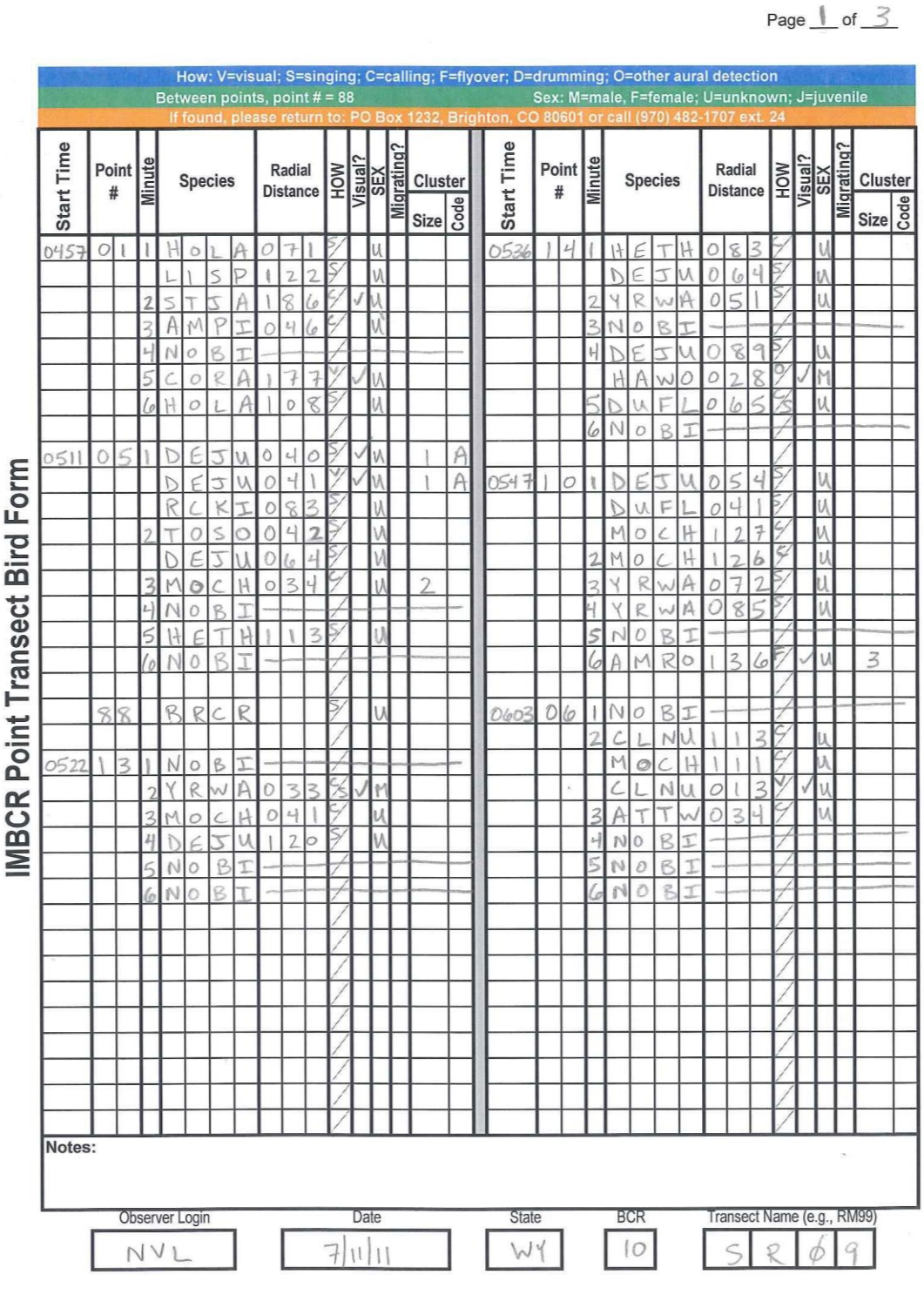


Figure 9. Example of completed Bird Datasheet

VII. Other Important Information

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

- **A.** Check to make sure you entered your observer initials, transect ID, and page numbers on EACH page.
- **B.** Record the end data for the survey (time, temp, sky, wind, transect notes) immediately upon completing the survey.
- **C.** 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.
- **D.** Provide clear and explicit directions to the survey location, including driving and hiking directions if necessary.
- **E.** Send an OK message to your supervisor using your Spot or inReach 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 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 survey. 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

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

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.

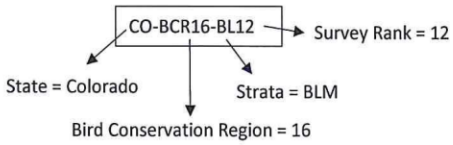
Appendix A. GPS Naming System

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.

Integrated Monitoring in Bird Conservation Regions Grid and GPS Point Label Explanation

The survey labels are based on the State, Bird Conservation Region (BCR), Strata Code (i.e. BLM = BL) and the Rank (The number of the sample).

Example IMBCR Survey Label



Point 1 GPS label = CO16-BL12-1

- CO = State
- 16 = Bird Conservation Region
- BL = Strata Code
- 12 = Survey Rank
- 1 = Point 1

Point Number	GPS Label
1	CO16-BL12-1
2	CO16-BL12-2
3	CO16-BL12-3
4	CO16-BL12-4
5	CO16-BL12-5
6	CO16-BL12-6
7	CO16-BL12-7
8	CO16-BL12-8
9	CO16-BL12-9
10	CO16-BL12-10
11	CO16-BL12-11
12	CO16-BL12-12
13	CO16-BL12-13
14	CO16-BL12-14
15	CO16-BL12-15
16	CO16-BL12-16

16 point grid with points and GPS labels

④ CO16-BL12-4	③ CO16-BL12-3	② CO16-BL12-2	① CO16-BL12-1
⑧ CO16-BL12-8	⑦ CO16-BL12-7	⑥ CO16-BL12-6	⑤ CO16-BL12-5
⑫ CO16-BL12-12	⑪ CO16-BL12-11	⑩ CO16-BL12-10	⑨ CO16-BL12-9
⑯ CO16-BL12-16	⑮ CO16-BL12-15	⑭ CO16-BL12-14	⑬ CO16-BL12-13

Appendix B. Key of Two-Letter Codes for Woody Vegetation

Code	CommonName	ScientificName	States
AA	Acacia	Acacia sp.	AZ, CA, KS, NM, NV, OK, TX, UT
AG	Agave	Agave sp.	AZ, CA, NM, NV, TX, UT
AL	Alder	Alnus sp.	AZ, CA, CO, ID, KS, MT, NM, ND, NV, OK, TX, UT, WA, WY
AE	American Elm	Ulmus americana	CO, KS, MT, ND, NE, OK, SD, TX, WY
HH	American Hophornbeam	Ostrya virginiana	KS, ND, NE, OK, SD, TX, WY
LI	American Linden / Basswood	Tilia americana	KS, ND, NE, OK, SD
AP	American Plum	Prunus americana	All
AM	Apache Plume	Fallugia paradoxa	AZ, CA, CO, NM, NV, OK, TX, UT
AW	Arizona Black Walnut	Juglans major	AZ, NM, OK, TX, UT
AC	Arizona Cypress	Cupressus arizonica	AZ, CA, NM, NV, TX, UT
AH	Ash	Fraxinus sp.	All
AK	Ashy Silktassel	Garrya flavescens	AZ, CA, NM, NV, UT
BA	Baccharis / Mule Fat	Baccharis sp.	AZ, CA, CO, KS, NM, NV, OK, OR, TX, UT
BP	Balsam Poplar	Populus balsamifera	CA, CO, ID, MT, ND, NV, OR, SD, UT, WA, WY
BT	Barrel Cactus	Ferocactus sp.	AZ, CA, NM, NV, TX, UT
BE	Beaked Hazelnut	Corylus cornuta	CA, CO, ID, MT, ND, OR, SD, WA, WY
BG	Beargrass	Nolina sp.	AZ, CA, CO, NM, NV, OK, TX, UT
BM	Bigtooth Maple	Acer grandidentatum	AZ, CO, ID, MT, NM, NV, TX, UT, WA, WY
BI	Birch	Betula sp.	All
BY	Bitter Cherry	Prunus emarginata	AZ, CA, ID, MT, NM, NV, OR, UT, WA, WY
PT	Black Cottonwood	Populus trichocarpa	CA, ID, MT, ND, NV, OR, WA, WY, UT
BN	Black Walnut	Juglans nigra	CO, KS, ND, NE, NM, OK, SD, TX, UT
BB	Blackberry / Raspberry / Thimbleberry	Rubus sp.	All
BL	Blackbrush	Coleogyne ramosissima	AZ, CA, CO, NV, UT
BK	Bladder Sage	Salazaria mexicana	AZ, CA, NV, TX, UT
BS	Blue Spruce	Picea pungens	AZ, CO, ID, NM, UT, WY
BX	Box Elder	Acer negundo	All
BR	Bristlecone Pine	Pinus aristata	AZ, CO, NM
EN	Brittlebush	Encelia sp.	AZ, CA, NV, UT
AB	Buckthorn	Rhamnus sp.	All
BF	Buffaloberry	Shepherdia canadensis	AZ, CA, CO, ID, MT, ND, NM, NV, OR, SD, UT, WA, WY
BO	Bur Oak	Quercus macrocarpa	CO, KS, MT, ND, NE, NM, OK, SD, TX, WY
BC	burnt conifer	NULL	All
BD	burnt deciduous	NULL	All
BW	Burroweed	Isocoma tenuisecta	AZ, NM, TX
LU	Bush Lupine	Lupinus sp.	All
BH	Buttonbush	Cephalanthus	AZ, CA, KS, NE, OK, TX

Code	CommonName	ScientificName	States
		occidentalis	
CL	Catalpa	Catalpa sp.	CA, KS, NE, OK, OR, SD, TX
CM	Catclaw mimosa	Mimosa aculeaticarpa	AZ, NM, TX
CA	Ceanothus	Ceanothus sp.	All
CB	Chaffbush	Amphipappus sp.	AZ, CA, NV, UT
CK	Chickasaw Plum	Prunus angustifolia	CA, CO, KS, NE, NM, OK, TX
CP	Chihuahuan Pine	Pinus leiophylla	AZ, NM
CC	Choke Cherry	Prunus virginiana	All
CH	Cholla / Pencil Cactus	Cylindropuntia sp.	AZ, CA, CO, KS, NM, NV, OK, TX, UT
CR	Cliffrose / Bitterbrush	Purshia sp.	AZ, CA, CO, ID, MT, NE, NM, NV, OR, TX, UT, WA, WY
CJ	Common Juniper	Juniperus communis	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OR, SD, UT, WA, WY
CO	Condalia	Condalia sp.	AZ, CA, NM, TX
CW	Crack Willow	Salix fragilis	CO, ID, KS, MT, ND, NE, NM, OR, SD, UT, WY
CE	Creosote	Larrea tridentata	AZ, CA, NM, NV, TX, UT
CT	Crucifiction Thorn	Canotia holacantha	AZ
DL	Dalea / Prairie Clover / Featherplume	Dalea 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	Prunus fasciculata	AZ, CA, NV, UT
DH	Desert Honeysuckle	Anisacanthus thurberi	AZ, NM
LV	Desert Lavender	Hyptis emoryi	AZ, CA, NV
DO	Desert Olive	Forestiera neomexicana	AZ, CA, CO, NM, NV, OK, TX, UT
DP	Desert Polygala	Polygala acanthoclada	AZ, CA, UT
DR	Desert Rue	Thamnosma montana	AZ, CA, NV, UT
DS	Desert spoon / Sotol	Dasylirion wheeleri	AZ, NM, TX
DE	Desert Willow / Desert Catalpa	Chilopsis linearis	AZ, CA, KS, NM, NV, OK, TX, UT
DW	Dogwood	Cornus sp.	All
DF	Douglas Fir	Pseudotsuga menziesii	AZ, CA, CO, ID, MT, NM, NV, OR, TX, UT, WA, WY
EB	Elderberry	Sambucus sp.	All
EM	Elm	Ulmus sp.	All
ES	Engelmann Spruce	Picea engelmannii	AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY
FD	Fairy Duster	Calliandra eriophylla	AZ, CA, NM, TX
FB	Fendlerbush	Fendlera rupicola	AZ, CO, NM, NV, TX, UT
FE	Fernbush	Chamaebatiaria millefolium	AZ, CA, CO, ID, NM, NV, OR, TX, UT
FH	Fool's Huckleberry	Menziesia ferruginea	CA, ID, MT, OR, WA, WY
FC	Fremont Cottonwood	Populus fremontii	AZ, CA, CO, NM, NV, TX, UT

Code	CommonName	ScientificName	States
FM	Fremont Mahonia / Barberry / Desert Holly	Berberis sp.	AZ, CA, CO, ID, KS, MT, ND, NE, NM, NV, OR, SD, TX, U WA, WY
FR	Fremont's Buckwheat / Crispleaf Buckwheat	Eriogonum corymbosum	AZ, CO, NM, NV, UT, WY
GO	Gambel Oak	Quercus gambelii	AZ, CO, NM, NV, OK, SD, TX, UT, WY
TT	Glandulare Labrador Tea/Trappers Tea	Ledum Glandulosum	CA, ID, MT, NV, OR, UT, WA, WY
GL	Globemallow	Sphaeralcea sp.	AZ, CA, CO, KS, NE, NM, NV, OK, TX
GB	Gooseberry / Currant	Ribes sp.	All
GF	Grand Fir	Abies grandis	CA, ID, MT, OR, WA
LB	Graythorn/Lotebush	Ziziphus obtusifolia	AZ, CA, NM, NV, OK, TX, UT
GW	Greasewood	Sarcobatus sp.	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OR, SD, TX, UT, WA, WY
GA	Green Ash	Fraxinus pennsylvanica	CO, KS, MT, ND, NE, NM, OK, SD, TX, UT, WY
GM	Greenmolly	Bassia americana	AZ, CA, CO, ID, MT, NM, NV, OR, TX, UT, WY
GY	Gum Bully / Woolly Buckthorn	Sideroxylon lanuginosum	AZ, KS, NM, OK, TX
HK	Hackberry	Celtis sp.	All
HA	Hawthorn	Crataegus sp.	All
EC	Hedgehog Cactus	Echinocereus sp.	AZ, CA, CO, KS, NE, NM, NV, OK, SD, TX, UT, WY
HC	Hickory	Carya sp.	KS, ND, NE, OK, TX
HL	Honey Locust	Gleditsia triacanthos	All
HT	Hoptree	Ptelea sp.	AZ, CO, KS, NE, NM, TX, UT
HO	Horsebrush	Tetradymia sp.	AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY
HB	Huckleberry	Vaccinium sp.	AZ, CO, ID, KS, MT, ND, NM, OR, SD, TX, UT, WA, WY
XX	Identified But Not Listed	NULL	All
IC	Incense Cedar	Calocedrus decurrens	CA, NV, OR
IB	Indigo bush / Leadplant	Amorpha sp.	All
IO	Iodinebush	Allenrolfea occidentalis	AZ, CA, ID, NM, NV, OR, TX,UT
JP	Jeffrey Pine	Pinus jeffreyi	CA, NV, OR
JO	Jojoba	Simmondsia chinensis	AZ, CA, UT
JT	Joshua Tree	Yucca brevifolia	AZ, CA, NV, UT
JU	Juniper	Juniperus sp.	All
KC	Kentucky Coffee Tree	Gymnocladus dioicus	KS, ND, NE, OK, SD, TX
KO	Kochia / Molly /Burningbush / Smotherweed	Bassia sp.	All
LM	Limber Pine	Pinus flexilis	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OR, SD, UT, WY
LW	Little Walnut	Juglans microcarpa	KS, NM, OK, TX
LL	Loblolly Pine	Pinus taeda	OK, TX
LT	Locust sp.	Robinia sp.	All
LP	Lodgepole Pine	Pinus contorta	CA, CO, ID, MT, NV, OR, SD, UT, WA, WY
MD	Madrone	Arbutus arizonica	AZ, NM
MZ	Manzanita	Arctostaphylos sp.	AZ, CO, MT, NM, TX, UT, WY

Code	CommonName	ScientificName	States
ML	Maple	Acer sp.	All
MR	Mariola	Parthenium incanum	AZ, NM, NV, TX, UT
ME	Mesquite	Prosopis sp.	AZ, CA, CO, KS, NM, NV, OK, TX, UT
MK	Mock Orange	Philadelphus sp.	AZ, CA, CO, ID, MT, NM, NV, OK, OR, TX, UT, WA, WY
MB	Mojave sea-blite	Suaeda moquinii	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OR, SD, TX, UT, WA, WY
MT	Mormon Tea	Ephedra sp.	AZ, CA, CO, NM, NV, OK, OR, TX, UT, WY
MO	Mountain Ash	Sorbus scopulina	AZ, CA, CO, MT, ND, NM, NV, OR, SD, UT, WA, WY
MH	Mountain Hemlock	Tsuga mertensiana	CA, ID, MT, NV, OR, WA
MM	Mountain Mahogany	Cercocarpus sp.	AZ, CA, CO, ID, KS, MT, NE, NM, NV, OK, OR, SD, TX, UT, WA, WY
MS	Mountain Spray / Oceanspray	Holodiscus sp.	AZ, CA, CO, ID, MT, NM, NV, OR, TX, UT, WA, WY
MU	Mulberry	Morus sp.	All
NC	Narrow-leaf Cottonwood	Populus angustifolia	AZ, CA, CO, ID, MT, NE, NM, NV, SD, TX, UT, WA, WY
LC	New Mexico Locust	Robinia neomexicana	AZ, CA, CO, NM, NV, TX, UT, WY
NB	Ninebark	Physocarpus sp.	All
OB	Oak	Quercus sp.	All
OL	Ocotillo	Fouquieria splendens	AZ, CA, NM, NV, TX
OR	Oreganillo	Aloysia wrightii	AZ, CA, NM, NV, TX, UT
OX	Oregon Boxwood	Paxistima myrsinites	All
OG	Oregon-grape	Mahonia aquifolium	AZ, CA, CO, ID, MT, ND, NE, NM, OR, SD, TX, UT, WA, WY
OE	Osage Orange	Maclura pomifera	CA, CO, KS, NE, NM, OK, OR, SD, TX, UT, WA
YE	Pacific Yew	Taxus brevifolia	CA, ID, MT, NV, OR, WA
PV	Palo Verde	Cercidium floridum	AZ, CA, NV
PB	Paper Birch	Betula papyrifera	CO, ID, MT, ND, NE, OR, SD, WA, WY
PW	Peachleaf Willow	Salix amigdaloides	All
PM	Persimmon	Diospyros sp.	CA, KS, NE, OK, TX, UT
PY	Pinyon Pine	Pinus edulis	AZ, CA, CO, NM, NV, OK, TX, UT, WY
PC	Plains Cottonwood	Populus deltoides	AZ, CO, KS, MT, ND, NE, NM, OK, SD, TX, UT, WY
PI	Poison Ivy	Toxicodendron radicans	AZ, KS, NE, OK, SD, TX
PP	Ponderosa Pine	Pinus ponderosa	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OK, OR, SD, TX, UT, WA, WY
PO	Poplar	Populus sp.	All
PA	Prickly Ash	Zanthoxylum americanum	KS, ND, NE, OK, SD, TX
OP	Prickly Pear	Opuntia sp.	All
AS	Quaking Aspen	Populus tremuloides	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OR, SD, TX, UT, WA, WY
RA	Rabbitbrush	Chrysothamnus sp.	AZ, CA, CO, ID, KS, MT, NE, NM, NV, OK, OR, TX, UT, WA, WY
BU	Ragweed / Bursage	Ambrosia sp.	All
RR	Range Ratany	Krameria parvifolia	AZ, CA, NM, NV, TX, UT

Code	CommonName	ScientificName	States
RS	Ratany sp.	Krameria sp.	AZ, CO, KS, NM, OK, TX, UT
RG	Rayless Goldenhead	Acamptopappus sphaerocephalus	AZ, CA, NV, UT
RB	Redbud	Cercis sp.	AZ, CA, KS, NM, NE, NV, OK, TX, UT
RD	Red-osier Dogwood	Cornus sericea	AZ, CA, CO, ID, KS, MT, ND, NE, NM, NV, OR, SD, UT, WA, WY
RH	Rhododendron	Rhododendron sp.	CA, CO, ID, MT, OK, OR, TX, WA
MA	Rocky Mountain Maple	Acer glabrum	All
RO	Russian Olive	Elaegnus angustifolia	All
SA	Sagebrush	Artemisia sp.	All
CG	Saguaro	Carnegiea gigantea	AZ, CA
SL	Saltbush	Atriplex sp.	All
SD	Sand Cherry	Prunus pumila	CO, KS, MT, ND, NE, OR, SD, UT, WY
SB	Serviceberry	Amelanchier sp.	All
SR	Shinnnery Oak / Havard Oak	Quercus havardii	AZ, CO, KS, NM, OK, TX, UT
LO	Shrub Live Oak	Quercus turbinella	AZ, CA, CO, NM, NV, TX, UT
SC	Shrubby Cinquefoil	Pentaphylloides floribunda	AZ, CA, CO, ID, MT, ND, NM, OR, SD, UT, WA, WY
EL	Siberian Elm	Ulmus pumila	All
SI	Siberian Peashrub / Caragana	Caragana arborescens	CA, CO, ID, MT, ND, NE, NM, OR, SD, UT, WA, WY
SM	Silver Maple	Acer saccharinum	CA, WA, ND, SD, NE, KS, OK, TX, NM
SE	Single-leaf Ash	Fraxinus anomala	AZ, CA, CO, NM, NV, UT, WY
SK	Skunkbrush	Rhus trilobata	All
SS	Smooth Sumac	Rhus glabra	All
SN	Snag	NULL	All
SW	Snakeweed	Gutierrezia sarothrae	All
SY	Snowberry	Symphoricarpos sp.	All
YS	Soaptree Yucca	Yucca elata	AZ, NM, NV, TX, UT
PS	Southwestern White Pine	Pinus strobiformis	AZ, CO, NM, TX
ST	Spindletree / Wahoo	Euonymus sp.	CO, KS, MT, ND, NE, OK, SD, TX
SH	Spiny Hopsage	Grayia spinosa	AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA WY
SP	Spiraea	Spiraea betulifolia	ID, MT, ND, OR, SD, WA, WY
SU	Subapline Fir	Abies lasiocarpa	AZ, CA, CO, ID, MT, NM, NV, UT, WA, WY
SZ	Sugar Sumac	Rhus ovata	AZ, CA
US	Sumac	Rhus sp.	All
PL	Sycamore	Platanus sp.	AZ, CA, KS, NE, NM, OK, TX, WA
TA	Tamarisk / Saltcedar	Tamarix pentandra	All
TR	Tarbush	Flourensia cernua	AZ, NM, TX
TH	Tree of Heaven	Ailanthus altissima	AZ, CA, CO, ID, KS, NE, NM, NV, OK, OR, TX, UT, WA
TW	Twinberry / Bush Honeysuckle	Lonicera sp.	All
UC	Unknown coniferous species	NULL	All
UD	Unknown deciduous species	NULL	All

Code	CommonName	ScientificName	States
OT	Unknown Plant	NULL	All
VI	Viburnum	Viburnum sp.	CA, CO, ID, KS, MT, ND, NE, NM, OK, OR, SD, TX, WA, WY
WB	Water Birch	Betula occidentalis	AZ, CA, CO, ID, MT, ND, NE, NM, NV, OR, SD, UT, WA, WY
WX	Waxflower	Jamesia americana	AZ, CA, CO, NM, NV, UT, WY
HE	Western Hemlock	Tsuga heterophylla	CA, ID, MT, OR, WA
LA	Western Larch	Larix occidentalis	ID, MT, OR, UT, WA, WY
WC	Western Red Cedar	Thuja plicata	CA, ID, MT, OR, WA
WW	Western White Pine	Pinus monticola	CA, ID, MT, NV, OR, UT, WA
WF	White Fir	Abies concolor	AZ, CO, ID, NM, NV, OR, UT, WY
WS	White Spruce	Picea glauca	ID, MT, SD, WY
WP	Whitebark Pine	Pinus albicaulis	CA, ID, MT, NV, OR, WA, WY
PF	White-stem Paper-flower	Psilostrophe cooperi	AZ, CA, NM, NV, UT
WT	Whitetop / Pepperweed / Cress Shrub	Cardaria / Lepidium sp.	All
WG	Wild Grape	Vitis sp.	All
WR	Wild Rose	Rosa sp.	All
WI	Willow	Salix sp.	All
WY	Wingleaf Soapberry	Sapindus saponaria	AZ, CO, NM, KS, OK, TX
WN	Winterfat	Krascheninnikovia lanata	All
WO	Wolfberry	Lycium pallidum	AZ, CA, CO, NM, NV, OK, TX, UT
WU	Wright's Buckwheat	Eriogonum wrightii	AZ, CA, NM, NV, TX, UT
YU	Yucca	Yucca sp.	AZ, CA, CO, KS, MT, ND, NE, NM, NV, OK, SD, TX, UT, WY

Appendix C. Four-Letter Bird Code

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
American Woodcock	AMWO
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

Common Name	Code
Baltimore Oriole	BAOR
Baltimore X Bullock's Oriole Hybrid	BBOH
Band-tailed Pigeon	BTPI
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-bellied Whistling Duck	BBWD
Black-billed Cuckoo	BBCU
Black-billed Magpie	BBMA
Black-capped Chickadee	BCCH
Black-capped Gnatcatcher	BCGN

Common Name	Code
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
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

Common Name	Code
Bridled Titmouse	BRTI
Broad-billed Hummingbird	BBLH
Broad-tailed Hummingbird	BTHU
Broad-winged Hawk	BWHA
Bronzed Cowbird	BROC
Brown Creeper	BRCR
Brown Pelican	BRPE
Brown Thrasher	BRTH
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
Canada Jay	CAJA
Canvasback	CANV
Canyon Towhee	CANT
Canyon Wren	CANW
Carolina Chickadee	CACH
Carolina Wren	CARW

Common Name	Code
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
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 Name	Code
Common Merganser	COME
Common Nighthawk	CONI
Common Poorwill	COPO
Common Raven	CORA
Common Tern	COTE
Common Yellowthroat	COYE
Connecticut Warbler	CONW
Cooper's Hawk	COHA
Cordilleran Flycatcher	COFL
Costa's Hummingbird	COHU
Crested Caracara	CRCA
Crissal Thrasher	CRTH
Curve-billed Thrasher	CBTH
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

Common Name	Code
Eastern Kingbird	EAKI
Eastern Meadowlark	EAME
Eastern Phoebe	EAPH
Eastern Screech-Owl	EASO
Eastern Towhee	EATO
Eastern Whip-poor-will	EWPW
Eastern Wood-Pewee	EAWP
Elegant Trogon	ELTR
Elf Owl	ELOW
Eurasian Collared-Dove	EUCD
European Starling	EUST
Evening Grosbeak	EVGR
Ferruginous Hawk	FEHA
Ferruginous Pygmy-Owl	FEPO
Field Sparrow	FISP
Fish Crow	FICR
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

Common Name	Code
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 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
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

Common Name	Code
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
Herring Gull	HERG
Hooded Merganser	HOME
Hooded Oriole	HOOR
Hooded Warbler	HOWA
Horned Grebe	HOGR
Horned Lark	HOLA
House Finch	HOFI
House Sparrow	HOSP
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

Common Name	Code
Lazuli Bunting	LAZB
Le Conte's Sparrow	LCSP
Le Conte's Thrasher	LCTH
Least Bittern	LEBI
Least Flycatcher	LEFL
Least Sandpiper	LESA
Least Tern	LETE
Lesser Goldfinch	LEGO
Lesser Nighthawk	LENI
Lesser Prairie-Chicken	LEPC
Lesser Scaup	LESC
Lesser Yellowlegs	LEYE
Lewis's Woodpecker	LEWO
Lincoln's Sparrow	LISP
Little Blue Heron	LBHE
Loggerhead Shrike	LOSH
Long-billed Curlew	LBCU
Long-billed Dowitcher	LBDO
Long-eared Owl	LEOW
Louisiana Waterthrush	LOWA
Lucy's Warbler	LUWA
MacGillivray's Warbler	MGWA
Magnificent Hummingbird	MAHU
Magnolia Warbler	MAWA
Mallard	MALL
Marbled Godwit	MAGO
Marsh Wren	MAWR
McCown's Longspur	MCLO

Common Name	Code
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
Nelson's Sparrow	NESP
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
Northern Hawk Owl	NOHO
Northern Mockingbird	NOMO
Northern Parula	NOPA
Northern Pintail	NOPI

Common Name	Code
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
Piping Plover	PIPL
Plumbeous Vireo	PLVI
Prairie Falcon	PRFA
Prothonotary Warbler	PROW

Common Name	Code
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
Rufous Hummingbird	RUHU

Common Name	Code
Rufous-crowned Sparrow	RCSP
Rufous-winged Sparrow	RWSP
Sage Thrasher	SATH
Sagebrush Sparrow	SABS
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
Snow Goose	SNGO
Snowy Egret	SNEG
Snowy Plover	SNPL
Solitary Sandpiper	SOSA
Song Sparrow	SOSP
Sooty Grouse	SOGR
Sora	SORA
Spotted Owl	SPOW
Spotted Sandpiper	SPSA
Spotted Towhee	SPTO
Sprague's Pipit	SPPI
Spruce Grouse	SPGR

Common Name	Code
Squirrel, Abert's	ABSQ
Squirrel, Red	RESQ
Steller's Jay	STJA
Stilt Sandpiper	STSA
Sulphur-bellied Flycatcher	SBFL
Summer Tanager	SUTA
Swainson's Hawk	SWHA
Swainson's Thrush	SWTH
Swamp Sparrow	SWSP
Tennessee Warbler	TEWA
Thick-billed Kingbird	TBKI
Townsend's Solitaire	TOSO
Townsend's Warbler	TOWA
Tree Swallow	TRES
Tropical Kingbird	TRKI
Trumpeter Swan	TRUS
Tufted Titmouse	TUTI
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

Common Name	Code
Unknown Duck	UNDU
Unknown Empidonax	UNEM
Unknown Falcon	UNFA
Unknown Finch	UNFI
Unknown Flicker	UNFR
Unknown Flycatcher	UNFL
Unknown Gnatcatcher	UNGN
Unknown Grosbeak	UNGB
Unknown Grouse	UNGR
Unknown Gull	UNGU
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 Pipit	UNPI
Unknown Quail	UNQU
Unknown Raptor	UNRA
Unknown Raven	UNRV
Unknown Sandpiper	UNSA
Unknown Sapsucker	UNSS
Unknown Sparrow	UNSP
Unknown Swallow	UNSW

Common Name	Code
Unknown Swift	UNSI
Unknown Tanager	UNTA
Unknown Tern	UNTE
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
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

Common Name	Code
Western Screech-Owl	WESO
Western Tanager	WETA
Western Wood-Pewee	WEWP
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-headed Woodpecker	WHWO
White-tailed Kite	WTKI
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
Wilson's Snipe	WISN
Wilson's Warbler	WIWA
Winter Wren	WIWR
Wood Duck	WODU
Woodhouse’s Scrub-Jay	WOSJ

Common Name	Code
Wood Thrush	WOTH
Yellow Warbler	YEWA
Yellow-bellied Sapsucker	YBSA
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