**Breeding Bird Monitoring Protocol for the Heartland Inventory and Monitoring Program**

**Standard Operation Procedure 4: Conducting the Variable Circular Plot Count**

**Version 3.00 (05/22/2019)**

**Revision History Log:**

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| Previous Version # | Revision Date | Author | Changes Made | Reason for Change | New Version # |
| 1.01 | May 2008 | D.G. Peitz | Entire document | Edited to reflect that bird monitoring has been expanded to ten additional network parks | 2.00 |
| 2.00 | May 2018 | D.G. Peitz | Updated throughout to NRR format. | Made SOP NRSS compliant. | 3.00 |
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This Standard Operating Procedures gives step-by-step instructions for conducting 5-minute bird counts at parks within the Heartland Inventory and Monitoring Network using the variable circular plot methodology. The Standard Operating Procedures describe the procedure for collecting data and filling in the data form “Field Data Form – Variable Circular Plot Counts” (Form 1).

**Procedures**

1. Prior to the day of the counts, determine which plots will be sampled and in which order and make a list of the UTMX and UTMY coordinates for those plots. Either have those coordinates loaded into a GNSS unit that will be taken into the field or create a list of those coordinates so that they can be entered into the unit while in the field.
2. Sampling will occur in the morning, beginning as soon as it is light enough to see a distance of at least 200 m and ending no later than 4 hours after official sunrise. Observers should try to arrive at the first plot while it is still dark so that the count can begin as soon as it is light enough to see. Singing rate for most species is usually highest before or near official sunrise and then declines slowly for the next four hours.
3. Do not conduct counts during high winds or heavy rains because these conditions inhibit bird activity and impair the observer’s ability to see and hear birds. However, light rains can increase bird activities in some instances. Counts should not be conducted if wind strength on the Beaufort Scale is a sustained 4 or greater (see Table 4.1), or if it is raining hard or snowing (rain code >4 in Table 4.2). If these conditions are encountered, wait until the weather improves or cancel the sampling for that day and try again on the next suitable day.
4. Navigate to the coordinates of each plot on the list using a GNSS unit. Approach the plot vigilantly, and if a bird is observed close to the center of the plot that flushes as a result of the observer’s approach, record the initial distance from the plot center to that bird on the data form. The reason for this is that a critical assumption of the distance methodology is that any bird directly at (or very close to, e.g., <5-10 m) the plot center will always be detected, i.e. g(0) = 1. If the data are analyzed as grouped data (as recommended), this is not a problem if the bird does not move beyond the first grouping interval. However, if a bird that otherwise would have been recorded in the plot during the count flushes prior to the beginning of the count as a result of the approach of the observer, abundance will be underestimated for that species. The alternative approach is to wait for several minutes after reaching the plot before starting the count, but this approach is likely to underestimate bird density near the plot because of birds flushing as the observer approaches.
5. Once the observer arrives at the plot center, begin the count as soon as possible. Observers should have time to fill in the location, event, and weather conditions information at the top of the form during the count. If not, this information can be filled in at the end of the 5-minute count.
6. Set a watch or other device to beep at 3 minutes, and then begin the count. Once the 3-minute mark is reached, make a mark on the VCP data form and continue the count for another 2 minutes, making sure that “3-5” is recorded in the Time Interval column for any species detected between 3 and 5 minutes. Only new birds should be recorded during the later time period.
7. Use a new copy of the “Field Data Form – Variable Circular Plot Counts” for each 5-minute count. Even if no birds are detected at a particular plot, there should still be a form for that plot each time it is sampled (with the first line on the form filled in as explained below under the Species code). As soon as possible during or just after the 5-minute count, record the following information at the top of the form:

Location ID: This is the Location Identification code stored in the HTLN\_Landbird database to refer to a particular place on the ground (the plot ID code). If the LocationID is not known for the particular plot, or if a new plot is being established, instead record the 4-character ParkCode (i.e. ARPO, HEHO, TAPR, etc.) and the Location Description, such as “TAPR Plot #46”. The LocationID usually contains the 4-character ParkCode, 6-character Project Code (“Tweety”) and a plot number assigned by the Project Manager. An example is ARPOTweety11 for Plot Number 11 at Arkansas Post National Memorial.

Park: Record the appropriate ParkCode (i.e. ARPO, HEHO, TAPR, etc.) for the plot. If the LocationID is already known for the plot, it will contain the ParkCode and this field does not need to be recorded.

Location Description: This is a brief description (<200 characters) of the sampling location referred to by the LocationID code. An example would be “TAPR Plot #46”, but it could also be something like “Bird VCP plot number 46, 150 m north of highway marker 46 next to rock wall”. If the LocationID for the plot is already known, nothing is required to be recorded in this field because a description is already stored in the database.

Survey: This is the month (spelled out) surveys were started in a park for the year listed. Examples are May 2007 and June 2008.

Date (mm/dd/yyyy): Record the month (2 digits), day (2 digits) and year (4 digits) in the format shown. Include the forward slash. Examples are 05/02/2001 and 06/01/2001.

Starting time (hhmm): Record the time to the nearest minute when the 5-minute counting period begins, using the hour and minute format shown. Use military time (add 12 to the hour beginning with 1 pm through 11 pm). Fill in all four digits. Examples are 0630 (6:30 am), 0802 (8:02 am). Bird sampling should not occur during the afternoon, but for the habitat form 1:30 pm would be recorded as 1330 and 8:00 pm would be 2000.

Observer Initials: Fill in the three initials of the person conducting the counts using capital letters. If the observer does not have a middle name, either make one up or put an underscore for the middle initial to maintain a 3-character code for all observers. Examples would be DGP for David G. Peitz or SGF for Steven G. Fancy. In the database, these initials will correspond to the full name and contact information for that person. The 3-character initials in the database must be unique, and if two people have the same initials, one should be given an honorary middle name.

Temperature (C°): Record the ambient temperature during the 5-minute count in degrees Celsius, to one decimal place or rounded off to the nearest degree.

Wind (0-6): Record the wind code (0 through 6) from the following Table 4.1 as it applies to the strength of the wind during the 5-minute count. Record the average wind condition during the 5 minutes, not the maximum condition (do not worry about gusts).

**Table 4.1.** Codes (Beaufort scale) used to record wind strength during bird counts.

|  |  |
| --- | --- |
| **Wind Code** | **Explanation** |
| 0 | calm, smoke rises vertically (< 2 km/h) |
| 1 | smoke drifts (2-5 km/h) |
| 2 | light breeze felt on face, leaves rustle (6-12 km/h) |
| 3 | leaves and twigs in constant motion (13-19 km/h) |
| 4 | small branches move, raises loose paper, dust rises (20-29 km/h) |
| 5 | fresh breeze, small trees sway (30-39 km/h) |
| 6 | strong breeze, large branches moving, wind whistling (40-50 km/h) |

Rain (0-5): Record the rain code (0 through 5) from the following Table 4.2 as it applies to conditions during the 5-minute count.

**Table 4.2.** Codes used to record precipitation during bird counts.

|  |  |
| --- | --- |
| **Rain Code** | **Explanation** |
| 0 | no rain |
| 1 | mist or fog |
| 2 | light drizzle |
| 3 | light rain |
| 4 | heavy rain; difficult to hear birds |
| 5 | Snow |

Clouds (0-100): Record percent cloud cover, rounded off to the nearest 10 percent. This should be a number between 0 (no clouds) and 100 (complete overcast). If there are patches of clouds in different areas of the sky, try to image gathering all of them together into one part of the sky and recording what percent of cloud cover that would represent. Cloud cover is recorded because it affects bird activity and singing for many species.

Noise (0-3): Record the Noise Code (0-3; Table 4.3) that applies to background noise conditions during the count as it relates to the observer’s ability to hear birds.

**Table 4.3.** Codes used to record level of background noise as it effects observer’s ability to hear birds.

|  |  |
| --- | --- |
| **Noise Code** | **Explanation** |
| 0 | quiet; normal background noises; no interference |
| 1 | low noise; might be missing some high-pitched songs/calls of distant birds |
| 2 | medium noise; detection radius is probably substantially reduced |
| 3 | high noise; probably detecting only the loudest/closest birds |

Protocol Version: Record the version and date that version was released for the protocol that was followed during bird surveys. Example: “2.00 May 2008” indicates that the version of the bird protocol that was followed was 2.00 released May 2008.

1. Once a watch has been set and the 5-minute counting period has begun, record all birds heard or seen during the 5 minutes, regardless of their distance from the center of the plot. For flyovers (birds that fly above the top of the vegetation canopy, never touch down in field of view, and do not appear to be foraging, displaying, or behaving in any other way that might suggest a link to the habitat below them) a distance to the bird does not need to be estimated; instead just enter the species code and the number of individuals detected, as shown in step 11.
2. The distance recorded should be the horizontal distance in meters between the center of the plot (where the observer should be standing) and the location where the bird was first detected. If the bird is flying directly towards plot center and lands nearby, record the distance to where the bird was first seen flying, not the distance to where it landed. For species that occur in clusters or flocks, record the distance from the observer to the center of the flock, plus the flock size. If a bird is high in a tree, image dropping a plumb bob from the bird down to the ground, and measure the distance to that spot on the ground (the horizontal distance).
3. Many birds are heard but not seen. To estimate the distance to a bird that is only detected by sound, first try to determine where it is and select some object near the bird, such as a tree or rock that it is concealed by, and then estimate the distance to that object.
4. For each bird heard or seen (at any distance) during the 5-minute counting period, record the following information on the "Field Data Form – Variable Circular Plot Counts”:

Time Interval: Enter either 0-3 or 3-5, depending on whether this bird (or flock) was first detected during the first 3 minutes of the count or during the last 2 minutes of the 5-minute count. This approach makes it possible to compare the data to those collected during national Breeding Bird Survey counts, which involve a 3-minute sampling period.

Observ. # (Observation Number): This is an observation number that will help tie records in the database back to the paper copy of the field data form. Each row on the data form will be given a number (1, 2, 3, 4, etc.). The numbers do not need to be sequential, so if a mistaken ID is recorded and a row must be deleted from the data sheet, it does not matter that there is a gap in the observation numbers.

Species: This is the 4-character AOU code for the species detected. Examples are WEME for Western Meadowlark, CCLO for Chestnut-collared Longspur and BHGR for Black-headed Grosbeak. These codes are usually easy to determine based on a bird’s AOU common name, except where more than one species has the same code and one has to be modified from the convention. Codes for species known to occur at parks in the Heartland Inventory and Monitoring Network are listed in Appendix C of the protocol narrative. If no birds are detected during a 5-minute count, data for the first line of the form (0-3 for Time Interval and 1 for Observ. #) should be recorded using the code NOBI for “No Birds” in the Species column.

Distance (m): Record the horizontal distance in meters between the center of the plot where the observer is standing and the location (or presumed location) of the bird where it was first detected. Use a laser range-finder whenever possible to get an accurate distance. Do not round off numbers to the nearest 5 m; estimate the distance to the nearest meter. If a bird cannot be seen, estimate the distance to some object (tree, bush, rock) near where the bird is most likely located.

DT (Detection Type): Record a number (1, 2, 4, 8 or 9) for the detection type based on the following explanations:

1 = heard first, but not seen (i.e., detected initially by sound) during the 5-minute count

2 = seen first (regardless of whether it was later heard or not) during the 5-minute count

4 = heard first, but then seen (a DT of 1 can be changed to a 4) during the 5-minute count

Two additional Detection Type codes can be used for birds that are not detected during the 5-minute count, but that are detected while traveling between plots or before or after the 5-minute sampling period begins. These data are useful for developing annual checklists of birds occurring in the park and for distribution information.

8 = heard, but not during the 5-minute sampling period

9 = seen, but not during the 5-minute sampling period

The Detection Type code will be used later in various analyses. For example, distances to birds that are seen (code 2 or 4) are probably more accurate than those to birds that are only heard (DT = 1). Recording the Detection Type makes it possible to develop distance histograms to compare birds seen versus those that are only heard. Also, there are likely to be different detection functions for birds heard versus seen, and recording the Detection Type makes it possible to analyze data separately if needed.

Sex: Record the sex (Male, Female, Unknown) of the bird whenever possible. If it is known that only males of a species sing, and a bird is detected only by song, record the sex as Male.

Age: Record the age category (Adult, Juvenile, Unknown) of the bird whenever possible.

Flock Size: For most species, each individual bird will be treated independently as a separate observation, but for species that usually occur in clusters or flocks, the appropriate unit is the cluster or flock not the individual bird. For example, if quail almost always occur in coveys of 10 to 40 birds, and a covey of 40 quail is observed during a count, it is not appropriate to record 40 distances and treat them as independent observations in the analysis. For flocking species, record the distance to the center of the flock and the number of birds in the flock, rather than the distance to each individual bird.

Prev. Plot (Previous Plot): Place an X in this column if the bird was already detected from a previous plot. Bias caused by repeated counting of the same individual from more than one plot is usually small unless repeated counting is common during a survey (Buckland et al. 1993) or in cases where a rare bird is counted from multiple plots (Nelson and Fancy 1999). Recording whether a bird is thought to have been counted at a previous plot allows the data to be analyzed two different ways, depending on which is most appropriate. Some authorities say that a bird should not be counter if it is thought that it was already recorded from another plot, whereas other authorities argue that detected birds should always be counted, even if it was probably detected previously. By placing an X in this column for those cases where a bird may have already been counted from another station, future investigators are allowed the option of analyzing data by either approach.

# Flyover (Number of Flyovers): Use the flyover column to record the number of birds of a particular species that fly above the top of the vegetation canopy, never touch down in field of view, and do not appear to be foraging, displaying, or behaving in any other way that might suggest a link to the habitat below them. These are birds that appear to just be passing over without actually utilizing the habitat being surveyed. Do not estimate distance to these birds; instead just enter the number of individuals detected, as shown in the example below.

Comments: Record any comments that seem appropriate and that might help someone interpret and analyze the data correctly.

1. At the end of the day, compare any recorded vocalizations with known bird sounds to identify all unknown bird species recorded in the field. If a species is seen in the field and characteristics recorded but it was not identified, it should be identified at this time using reference materials.

## **Literature Cited**

Buckland, S. T., D. R. Anderson, K. P. Burnham, and J. L. Laake. 1993. Distance sampling: Estimating abundance of biological populations. Chapman and Hall, New York. 446 pp.

Nelson, J. T. and S. G. Fancy. 1999. A test of the variable circular-plot method when exact density of a bird population was known. Pacific Conservation Biology 5:139-143.

Field Data Form – Variable Circular Plot Counts (Form 1)

# Example for filling in the field data form:

LocationID: TAPRTweety103 or Park: TAPR­­­­\_\_ and Location Description: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Survey: May 2001 Date (mm/dd/yyyy): 05/23/2001 Start Time (hhmm): 0916 Observer Initials: DGP

Conditions:

Temperature (C): 8.0 Wind (0-6): 1 Rain (0-5): 0 Clouds (0-100): 30 Noise (0-3): 0 Protocol Version: 1.0 May 2002

| Time Interval | Observ. # | Species | Distance (m) | DT | Sex | Age | Flock Size | Prev. Plot | # Fly Over | Comments |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0-3 | | 1 | WEME | 35 | 4 | M | A | 1 |  |  |  |
| 0-3 | | 2 | BHCO | 56 | 4 | M | A | 1 |  |  |  |
| 0-3 | | 3 | HOLA | 30 | 4 | M | A | 1 |  |  |  |
| 0-3 | | 4 | CLSW |  |  |  |  |  |  | 1 |  |
| 3-5 | | 5 | GRSP | 22 | 2 | M | A | 1 |  |  |  |
|  | |  |  |  |  |  |  |  |  |  |  |

In the example above, four birds were detected during the first 3 minutes of the count, and one (the Grasshopper Sparrow, GRSP) was detected during the second 2 minutes of the count. The first record, a Western Meadowlark (WEME) was heard, and then when the observer searched for it, it was seen at a distance of 35 m. The observer therefore recorded the Detection Type (DT) of 4 since it was heard and then seen. The bird was a male adult. The same occurred for the next two detections: a Brown-headed Cowbird (BHCO) was heard and then seen at a distance of 56 m, and a Horned Lark (HOLA) was heard and then seen at a distance of 30 m. When the Horned Lark was first seen it was flying at a distance of 30 m from the observer, and then landed about 80 m away. The distance of 30 m was recorded since that was the distance at which it was first detected. Also during the first 3 minutes of the count, a Cliff Swallow (CLSW) flew high across the plot and out of view. It was recorded as a flyover. No distance, sex or age was recorded for the flyover. Finally, about 4 minutes into the count, the observer spotted a Grasshopper Sparrow foraging in the grass about 22 m away. After it was spotted, it gave a call, but the DT was recorded as a 2 since it was seen before it was heard.

Field Data Form – Variable Circular Plot Counts (Form 1)

LocationID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or Park:\_\_\_\_\_\_\_\_\_ and Location Description: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Survey: \_\_\_\_\_\_\_\_\_\_\_ Date (mm/dd/yyyy): \_\_\_\_\_\_\_\_\_\_\_ Start Time (hhmm): \_\_\_\_\_\_\_\_\_\_ Observer Initials: \_\_\_\_\_\_\_

Conditions:

Temperature (C): \_\_\_\_ Wind (0-6): \_\_\_\_ Rain (0-5): \_\_\_\_ Clouds (0-100): \_\_\_\_ Noise (0-3): \_\_\_\_ Protocol Version: \_\_\_\_\_\_\_\_\_\_

| Time Interval | Observ. # | Species | Distance (m) | DT | Sex | Age | Flock Size | Prev. Plot | # Fly Over | Comments |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0-3 | 1 |  |  |  |  |  |  |  |  |  |
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#### **Variable Circular Plot Count Data Form: Categories, Definitions and Descriptions.**

Codes (Beaufort scale) used to record wind strength during bird counts.

|  |  |
| --- | --- |
| Wind Code | Explanation |
| 0 | Calm, smoke rises vertically (< 2 km/h) |
| 1 | Smoke drifts (2-5 km/h) |
| 2 | Light breeze felt on face, leaves rustle (6-12 km/h) |
| 3 | Leaves and twigs in constant motion (13-19 km/h) |
| 4 | Small branches move, raises loose paper, dust rises (20-29 km/h) |
| 5 | Fresh breeze, small trees sway (30-39 km/h) |
| 6 | Strong breeze, large branches moving, wind whistling (40-50 km/h) |

Codes used to record precipitation during bird counts.

|  |  |
| --- | --- |
| Rain Code | Explanation |
| 0 | No rain |
| 1 | Mist or fog |
| 2 | Light drizzle |
| 3 | Light rain |
| 4 | Heavy rain; difficult to hear birds |
| 5 | Snow |

Codes used to record level of background noise as it effects observer’s ability to hear birds.

|  |  |
| --- | --- |
| Noise Code | Explanation |
| 0 | quiet; normal background noises; no interference |
| 1 | low noise; might be missing some high-pitched songs/calls of distant birds |
| 2 | medium noise; detection radius is probably substantially reduced |
| 3 | high noise; probably detecting only the loudest/closest birds |

Codes used to record the type of detection (Detection Type, DT) of birds during a count.

|  |  |
| --- | --- |
| DT Code | Explanation |
| 1 | heard first, but not seen (i.e., detected initially by sound) during the 5-minute count |
| 2 | seen first (regardless of whether it was later heard or not) during the 5-minute count |
| 4 | heard first, but then seen (a DT of 1 can be changed to a 4) during the 5-minute count |
| 8 | heard between plots or not within the 5-minute sampling period |
| 9 | seen between plots or not within the 5-minute sampling period |