NEON FSU Field and Lab Protocol for Ops CPER 2011: Bird Abundance and Diversity

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1 INTRODUCTION

1.1 Purpose

The primary purpose of this document is to provide a change controlled version of Observatory protocols, and is the version used for external review by subject-matter experts. This document provides the content for training and field-based materials for NEON staff and contractors. Content changes (i.e. changes in particular tasks or safety practices) occur via this change controlled document, not through field manuals or training materials.

This document is a detailed description of the field data collection, relevant pre- and post-field tasks, and safety issues as they relate to this procedure and protocol.

1.2 Scope

This document relates the tasks for a specific field sampling or laboratory processing activity and directly associated activities and safety practices. This document does not describe:

- general safety practices (i.e. how to drive a boat)
- site-specific safety practices (e.g. how to safely walk in a stream)
- general maintenance (i.e. fill the car with gas)

It does identify procedure-specific safety requirements such as safe handling of small mammals or safe use of required chemicals and reagents.

1.3 Acknowledgements

If a protocol is based closely on the work of another program or author, note that here.
The method is adapted from the Rocky Mountain Bird Observatory 2010 field protocol for spatially balanced sampling of landbird populations (Hanni et al. 2010).

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Reference documents

(If you want to reference other procedural documents (e.g. associated Protocol document), drawings, etc. then include filenames in the following sections.)

RD[01]	NEON.NPR.000008. NEON Acronym List
RD[02}	EHS Safety Policy and Program Manual
RD]03…]	<primary science design docs explaining/justifying this protocol/these procedures>
RD[04]	NEON Sampling Design Document
RD[05]	Training Plan
RD[06]	NEON.NPR.000243 NEON Glossary of Terms
	QA/PA Plan
	DOORS requirements
	ATBD

2.2 Acronyms

NEON	National Ecological Observatory Network
FSU	The NEON Fundamental Sentinel Unit at Headquarters
P&P	Procedure and Protocol
CPER	Central Plains Experimental Range

3 BACKGROUND AND OBJECTIVES

3.1 Background

The purpose of this field manual is to describe in detail the bird sampling protocol to be performed during June and July, 2011 in association with the National Ecological Observatory Network (NEON) for Domain 10. The 2011 surveys are to be conducted within the Central Plains Experimental Range (CPER). The goal of the 2011 field season is twofold; first, to derive a statistically robust baseline for breeding birds within CPER and second, to field test the proposed bird sampling protocol such that it can be modified, if necessary, and applied in the future within Domain 10 and at other NEON domains to be sampled in the future.

3.2 Science requirements

This protocol fulfills the following Observatory science requirements:
List science requirements from DOORS that are met by this protocol.

3.3 Data products

List Level 0 data products measured by protocol.

Table 1. A summary of field and related lab measurements and the associated NEON Data Products.

Measurement	Data Product

4 PROTOCOL

During the 2011 field season, birds at CPER will be sampled using the point count method. Point counts are a standard scientific sampling method by which birds are quantified in the landscape at predetermined locations for a set period of time. Point counting will allow CPER/NEON surveys to be easily compared to both historical and future survey data within Domain 10 or other NEON domains.

Point counting entails one or more observers going to some number of pre-established points and recording all the birds heard and/or seen during a set period of time, usually between 5 and 10 minutes duration. The duration of the sampling window is typically longer in structurally more complex habitats such as forested ecosystems and shorter for spatially simpler systems such as grasslands. This difference is a function of the overall detectability of birds in different habitat types. In any habitat the duration of a survey should be long enough such that observers are confident that they are detecting the majority of birds at each point in the allotted time. For CPER, it is recommended that the initial point count duration be between 3 and 5 minutes. If for example, it is subsequently determined that sampling duration needs to be adjusted, the amount of time spent at each point can be changed as needed.

In addition to sampling duration, another important variable in the point count methodology is the "effective distance" within which birds can be expected to be detected. The effective distance at each point is the area within which observers might be expected to detect the majority of birds. As with overall detectability, the effective distance also varies as a function of habitat/visual complexity. For example, in forested systems one might expect to detect birds only audibly or visually within approximately 30 meters (100 feet) of a sampling point. Whereas in simple more open landscapes, the effective distance might be as far as approximately 100 meters (300 feet) from a sampling point. In addition to the role of vegetation complexity upon visual detection, audible detection of birds can be limited because of vegetation, as well as high ambient noise from such sources as the wind or from other species such as insects or frogs. Similarly, visual detection of birds can be hampered from dust, low clouds, flying snow, fog, or rain. For this reason, environmental data from the NEON towers will be important datasets that will augment the bird sampling data.

The location of the bird sampling grids will be adjacent to a subset of the NEON plant biodiversity plots. Exact locations will be pre-determined by the NEON Spatial Ecologist. As a guiding principle, bird sampling is stratified such that grid positions achieve representative coverage of important bird breeding habitats.

Because sampling for breeding birds is time consuming and therefore expensive, it is important to not over-sample a given site. Conversely, it is equally important to not compromise the research any goals of by under-sampling birds. From sampling statistics and field ornithology we know that presence-absence survey for birds often exhibit high variability in both space and time. Therefore, to offset this inherent variability bird surveys often require large sample sizes.

For the D10 Ops Prototype, a high-intensity sampling procedure is recommended wherein birds are sampled 8 times throughout the breeding season (see Table 2) from six 0.25 km^2 grids, with 9 sampling points located within each grid (see **Figure 1** for an illustration of the bird sampling grid). In **Figure 1**, the concentric circles represent points associated with high-resolution GPS coordinates; black diamonds are points reached by pacing and sighting position with a compass relative to the dashed grey line. This design results in a total of 432 point samples throughout the breeding season. This procedure should yield sufficient data to both characterize the breeding bird communities at CPER, as well as allow for statistical analyses of variance, and thereby the ability to adjust the sampling intensity either up or down in future years.

Point count sampling for breeding birds at CPER is proposed for the months of June and July. This two-month window corresponds to when most of the birds encountered will likely be resident, breeding birds rather than species that either over-winter at CPER or migrate through CPER during the spring or fall. To sufficiently characterize breeding birds it is recommended that sampling be conducted either once per week or once every two weeks, thus yielding not less than four and not more than eight sampling periods. Because the initiation of breeding activity varies between species, it is best to spread the sampling effort out evenly over this suggested two-month window. This approach provides the best opportunities to encounter and detect as many of the breeding birds within the vicinity of each sampling point as possible.

Breeding songbirds are most detectable during the early morning hours, typically between 30-60 minutes pre-dawn to 3-4 hours post-dawn. This time period corresponds to male territorial advertisements, vis-à-vis singing and/or calling. Similarly, but with less intensity, breeding bird males will advertise and defend their territories from 2 -3 hours pre-sunset to 1 hours post-sunset again. Therefore, dawn to 3-4 hours post-dawn, and 2-3 hours pre-sunset are the best times of the day to detect breeding songbirds during June and July. Combining both the morning and the evening time periods that are suitable for bird work, it is possible to perform bird abundance and diversity surveys for approximately 7 hours per day.

5 QUALITY ASSURANCE AND QUALITY CONTROL

The NEON QA/QC plan for these measurements is under development and TBD.

6 DECISION TREE

Delay	Action	Adverse Outcome	Outcome for Data Products
hours	Continue with sampling if there is still time in the sampling window around dawn. If miss the window for sampling around dawn, must skip sampling for the day. Additional sampling day should be added that same week to make up for this missed time.	Fewer samples will be collected.	fewer sampling points could result in less precise estimation of breeding bird species richness, diversity, or density
1-7 days	Add additional days on within the same two week period to sample all points.	More time than normally allotted is being spent at each plot, so fewer points may be sampled that day.	fewer sampling points could result in less precise estimation of breeding bird species richness, diversity, or density
8 or more days	Contact appropriate scientific lead(s) on the FSU team for guidance.	may miss target sampling window	1. Species richness due to changes in seasonal phenology could be influenced by significant changes in temporal sampling window. 2. Not completing all plots impacts diversity metrics and target sample size.

7 SAFETY

Personnel working at a NEON site should be familiar with and practice safe field work as outlined in the EHS Safety Policy and Program Manual. Additional safety issues associated with this field procedure are

outlined below. The Field Operations Manager and the Lead Field Technician have primary authority to stop work activities based on unsafe field conditions; however, all employees have the responsibility and right to stop their work in unsafe conditions.

Someone at NEON or CPER should be notified prior to going into the field and upon return from the field including the precise location of the sampling points scheduled to be sampled on each day of surveying. Each team must carry a general first aid kit, ample water and a supply of high-energy snack foods as well as a cell phone or 2-way walkie-talkie in the event that any portion of the sites to be surveyed lack sufficient cell phone coverage.

8 PERSONNEL REQUIREMENTS

The 2011 surveys of CPER will require the services of at least two field ornithologists working in a team. All field ornithologists should have the following expertise:

- Demonstrated knowledge and experience identifying birds both visually and audibly.
- Prior experience conducting avian field surveys with preference given to applicants with experience conducting breeding bird surveys.
- Specific prior field experience with birds of the western US with preference given to applicants who have demonstrated prior experience with bird of northern Colorado or southern Wyoming and within short grass steppe prairies.

9 TRAINING REQUIREMENTS

The NEON training plan associated with these activities is under development and TBD.

10 FIELD STANDARD OPERATING PROCEDURE

10.1 Sampling frequency and timing

Given that there are 6 sampling grids, 9 points per grid, and it takes 6 minutes per gridpoint to survey birds (not counting travel time between points), it follows that it will take a team of 2 field ornithologists approximately 4.5 hours in the field to complete the bird sampling in a given week. Allowing for additional travel time between grid points, as well as travel time between grids, we estimate that a team of 2 field ornithologists should be able to complete surveys at all 6 grids over the course of 2 days.

Table 2. Approximate sampling dates for bird abundance and diversity at the NEON CPER site.

Domain, Site	Date	Frequency
D10, CPER	June through July	Weekly

10.2 Contingency decisions

Please see Section 6

10.3 Field procedure

The following procedure illustrates how to acquire bird abundance and diversity data within a grassland ecosystem. The method is adapted from the Rocky Mountain Bird Observatory 2010 field protocol for spatially balanced sampling of landbird populations (Hanni et al. 2010).

10.3.1 Equipment and materials

The following equipment is sufficient for a team of 2 field technicians to collect bird abundance and diversity data.

Table 3. Materials and supplies required for vegetation structure measurements and aboveground biomass clip harvest procedure.

Item Description	Quantity per sampling event	Hazardous Chemical
10 × 40 binoculars	2 (one per person)	NA
Spotting scope	1 (one per team)	NA
Juno SB GPS	1 (one per team)	NA
Laser rangefinder	1 (one per team)	NA
Sibley Field Guide to Birds of N. America	1 (one per team)	NA
Rite-in-the-Rain datasheets	2 (one set per person	NA
Clipboard	2 (one per person)	NA
Mechanical pencils	2 (one per person)	NA
Declination adjustable compass w/ mirror sight	1 (one per team)	NA
Countdown timer w/ chime	1 (one per team)	NA
Master list of 4-letter species codes	1 (one per team)	NA
Gallon Ziploc bag (to collect dead bird specimens if encountered)	5	NA

10.3.2 Preparation

Two days prior to the anticipated field work, the following tasks should be completed:

- Binoculars need to be cleaned and checked to make sure they are in good working condition
- Batteries for the laser rangefinder should be checked with the ZTS tester, and charged if necessary
- Batteries for the Juno SB GPS unit should be charged if necessary
- Background images, layers, and waypoints associated with bird grids should be uploaded to the GPS unit.
- Data sheets should be printed and organized
- The appropriate declination should be set on the compasses.

Finally, for each bird grid, only the 3 center points are marked on the ground and are associated with high-resolution GPS coordinates (concentric circles in **Figure 1**). The remaining 6 points (marked with black diamonds) are located by first orienting with the compass, and then by pacing off steps. As such, it is necessary for each field technician to calibrate his/her paces with a meter tape prior to performing field work. To calibrate pacing, do the following:

1. Use either a steel or fiberglass 100 m tape, and lay out 50 meters in a straight line.
2. Walk the 50 m line and count the number of steps it takes to reach 50 m – repeat this 3 times, and calculate the average number of steps it takes to reach 50 m.
3. Multiply this number by 5 to obtain the number of steps that are equivalent to 250 meters.

10.3.3 Data collection in the field

1. Use a GPS unit pre-loaded with the appropriate bird grid layers and waypoints to locate one of the points on the center-line of the grid that will be sampled (concentric circle symbols connected by the dashed grey line in **Figure 1**).
    a. Concentric circle symbols in **Figure 1** are marked in the field with a large, labeled aluminum disk and/or flagging.
    b. Record the date and start-time in UTC, and the GPS coordinates on the "Bird point-count" datasheet.
2. Upon reaching a point on the grid, wait 2 minutes in order to allow the local birds to become accustomed to your presence. While waiting, fill in the required metadata on the "Bird point-count" datasheet.
    a. **DO NOT begin counting until this task is completed.**
    b. DO identify and make a mental note of the locations of any birds flushed from around the grid point upon approach.
3. Set the timer for **6 minutes**, begin the count-down, and begin recording the birds you see and/or hear into the "Bird point-count" datasheet.
4. For each independently detected bird, record the following information:
    a. The **species**, using the appropriate 4-letter code.
    b. The **distance** to the bird (measured with the rangefinder).
    c. **How** the bird was detected (visually, by song, etc.)
    d. The **sex** of the bird, if known (if the bird is a juvenile, enter "J")
    e. The **cluster size** and **cluster ID** code for any birds observed as part of a cluster (i.e. non-independent detections). See Appendix C for more information on how to distinguish and record clusters.
5. The following are a few general guidelines for collecting high-quality data:
    a. DO NOT record any other birds after the 6 minutes are over, even if it is an interesting bird (though this could be recorded in the "Notes" section of the datasheet if so desired).
    b. If you do not detect any birds in the 6 minute interval, record "NOBI" (No Birds).
    c. However, if you see an "88" bird after the 6 minutes has elapsed, you may record this species on the datasheet. See Appendix C for a list of which species are considered "88" species for Colorado (as determined by the Rocky Mtn. Bird Observatory).

d. If, during the 6 minute survey, you detect a bird that was flushed from the survey point upon your arrival, record the bird's original distance from the survey point. We assume that these birds would have remained at their original locations were it not for the disturbance created by the observer.

e. Focus primarily on birds that are close to the observation point. This is because missing distant birds has only a small effect on density estimates, but missing birds that are close by has a much larger effect on density estimates.

f. Look and listen in all directions – **including UP**.

   i. However, note that distance to birds is recorded radially in 2-dimensions from the observer. That is, a bird 10 meters up in a tree directly overhead would be recorded as zero meters from the observer.

g. Do not move from the observation point. That said, it is acceptable to take a step or two away from the point to identify a bird spotted from the point, but **ALWAYS** return ASAP to the point to continue observations.

h. Do NOT chase birds before or during the count. After the observation period has elapsed, you may chase down a bird to identify it, if you couldn't identify it from the point.

i. You may see or hear the same bird from multiple points. In this event:

   i. It is acceptable to record the same bird from multiple points only if the bird has not moved from its original position.

   ii. Example 1: A Western Meadowlark is visible from a fencepole from two different points, and the bird does not move from the fencepole. Result: record the Meadowlark twice – once from each point.

   iii. Example 2: A Red-Tailed Hawk soars above you, and you still see the hawk soaring from another point. Result: Record the hawk only once.

6. There are several potential issues when conducting point-counts that can lead to problems in the data:

   a. Window species – these are species that you see or listen through, because they are common. For example, Mourning Dove is a common window species.

   b. Look and listen everywhere – Look up regularly, and do not wear hats that obscure hearing (including wide-brimmed hats that deflect sound), or sunglasses that obscure vision.

   c. Stand at observation points – do not sit or kneel. Altering your position will affect your ability to consistently and repeatably see and hear birds.

   d. No "pishing" – do not make noises that can attract birds to you and alter the density estimation.

   e. Airplanes and other external noises – If audibility of birds is reduced by mechanical noise, then interrupt the count and resume when the noise abates. The total time spent counting should still equal 6 minutes.

f. Never guess the identity of a bird – If the bird species is unknown, use the table of unknown species codes in Appendix C. DO NOT FALSIFY DATA IF YOU ARE UNSURE OF A SPECIES ID.

g. Know the area – examine the site during daylight hours (remember that surveys occur at dawn or dusk). It will be easier to hike if you are familiar with the terrain.

h. Weather – Never conduct a point count if it is raining; birds are not very active in these conditions, and visibility may be poor. Also, do not conduct a point-count if it is windy enough that the noise hinders your ability to hear birds.

10.3.4 Sample preservation

Samples from live birds are not collected during normal field sampling. However, if field technicians encounter a dead bird specimen during routine sampling, it is NEON's desire to collect and archive these specimens. To accomplish this:

- Place the dead specimen in a gallon Ziploc bag.
- Return the specimen to the NEON Support Facility, and place in a –20 ˚C freezer.
- Consult with the Domain Manager or the FSU Manager to determine further bioarchive steps.

No bird salvage will occur during the 2011 Field Operations Prototype at CPER.

10.3.5 Sample shipping

Not applicable to this procedure.

10.3.6 Data handling

Upon returning to the Support Facility lab, enter data from the point-count datasheets into the appropriate MS Access database or Excel spreadsheet.

The NEON FSU science team is responsible for performing QA/QC on the bird abundance and diversity data.

10.3.7 Refreshing the field sampling kit

Ensure the following supplies are available in sufficient quantities to complete the next bout of point-count sampling:

- Water resistant paper for datasheets (Rite-in-the-Rain or equivalent)
- Gallon Ziploc bags for collection of any dead specimens

10.3.8 Equipment maintenance, cleaning, and storage

Maintain equipment for the next sampling day/bout by doing the following:

- Use lens tissue to clean the binocular lenses, as well as the rangefinder lenses (if necessary).
- Use the ZTS battery tester to check and recharge batteries (if necessary) for the laser rangefinder.
- Check battery levels on the GPS unit and recharge if necessary.
- Return all equipment to the appropriate storage location in the Support Facility lab.

11 LAB STANDARD OPERATING PROCEDURE

There is no laboratory procedure associated with this protocol.

12 DEFINITIONS

Define all protocol specific technical terms in alphabetical format.

13 REFERENCES

Hanni, D. J., C. M. White, R.A. Sparks, J. A. Blakesley, G. J. Levandoski, and J. J. Birek. 2010. Field protocol for spatially-balanced sampling of landbird populations. Unpublished report. Rocky Mountain Bird Observatory, Brighton, CO. 34 pp.

APPENDIX A Field data sheets

The following field data sheets serve as a backup procedure for times when electronic data collection devices (PDA) are not available.

Field data sheets to be prepared for the D10 2011 Field Ops prototype include:

- Bird point-count datasheet

Include copies of all data sheets – jpg format
(Data sheets are useful for CI to define PDA and data ingest requirements)

APPENDIX B Lab data sheets

There is no laboratory procedure associated with this protocol.

APPENDIX C Considerations for implementation

Include “cluster” definitions here, as well as list of “88” birds, and a list of common “unidentified” codes.

APPENDIX D Procedure checklist

Field QC checklists to be prepared for the D10 2011 Field Ops prototype include:

- Bird QC

APPENDIX E Figures

Figure 1. Diagram of the grid sampling unit used for assessing bird abundance and diversity at CPER.