

**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network
DRAFT**

Introduction

Version 2.0 (June 2007)

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Revision History Log

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.	-	-
2.0	April 2007	Knutson, et al.	Modified for Midwest/ NE U.S.	Some aspects (wilderness prep) don't apply to us

This is an introduction to the Passerine Bird Monitoring Protocol for National Wildlife Refuges (Midwest and Northeast) and National Parks of the Great Lakes Network. It describes the need for the protocol and is a summary of the scope and rationale for the associated Standard Operating Procedures (SOP). This protocol was modified from the Passerine Monitoring Protocol for the Central Alaska Network (McIntyre et al. 2004). The Passerine Bird Monitoring Protocol consists of an Introduction and the following Standard Operating Procedures:

- SOP 1: Sampling Designs
- SOP 2: Before the Field Season
- SOP 3: Hiring and Training Observers
- SOP 4: Using GPS to Locate and Mark Sampling Points
- SOP 5: Conducting the Bird Point Count
- SOP 6: Vegetation Monitoring
- SOP 7: After the Field Season
- SOP 8: Data Management
- SOP 9: Data Analysis
- SOP 10: Reporting
- SOP 11: Revising the Protocol

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I. Background, Objectives, Target Users

Why do we need a standardized protocol for monitoring passerine birds?

The need for a standardized protocol for monitoring passerines was identified by the U.S. Fish and Wildlife Service, National Wildlife Refuge System (NWRS) during the *Fulfilling the Promises* initiative (U.S. Fish and Wildlife Service 1999). This initiative was prompted by new legislation, the National Wildlife Refuge Improvement Act (U.S. Congress 1997), that broadened the mission of the Refuge System. The *Promises* Inventory and Monitoring Database Team (WH 9.1) reported that managing passerine point count data on refuges was a high need, ranking second in importance after waterfowl data (U.S. Fish and Wildlife Service 2004).

Most refuges, parks, and state agencies in the Midwest and Northeast were using one of two standardized protocols (Pence 1996; Howe et al. 1997) prior to the development of this protocol. Our contribution in writing a new/revised protocol is to attempt to standardize passerine breeding season monitoring across the Midwest and the Northeast on some federal lands and to collect data that will accommodate current approaches to estimating detection probabilities (Farnsworth et al. 2005). In addition, we address sampling design considerations and suggest sampling designs suitable for different management objectives.

Management objectives

The NWRS established a work group in 2005, with representatives from Regions 3, 4, and 5; their task was to develop a requirements analysis, review existing passerine (land bird) monitoring protocols, and recommend or modify a protocol for use on National Wildlife Refuges (see Acknowledgements). In March 2006 this work group conducted a survey asking refuges and wetland management districts in Regions 3 and 5 to clarify the need and rank management objectives for monitoring passerines (M. Knutson, unpub. data). Nearly 70% of the stations who responded to the survey collected passerine data during 2003-2005; 65% of stations reported that they plan to collect passerine data during 2006-2009. The most common habitats surveyed for passerines were forests, grasslands, shrublands, and marsh. Fifty-six percent of the stations would welcome some guidance regarding passerine monitoring and help with data management and analysis. The stations ranked their objectives (from high to low) for monitoring passerines:

- a. Baseline inventory (44% of stations identified this as their highest priority)
- b. Evaluation of management actions, local scale
- c. Detecting trends, local scale
- d. Evaluation of management actions, ecoregion or regional scale
- e. Detecting trends, regional scale
- f. Testing assumptions underlying biological models
- g. Detecting trends, national scale

A number of multi-agency work groups are focusing on passerine monitoring and working to clarify objectives, coordinate monitoring efforts, and identify gaps in North America. The North American Bird Conservation Initiative (NABCI) developed Bird Conservation Regions as part of their continental based conservation strategy for birds (<http://www.nabci-us.org/>). NABCI is a coalition of government agencies, private organizations, academic institutions, and private industry leaders in Canada, the United States, and Mexico working to ensure the long-term health of North America's native bird populations. NABCI recently released a report aimed at improving avian monitoring (Van Horne et al. 2007). The Upper Mississippi River and Great

Lakes Region Joint Venture has also issued a draft Land Bird Habitat Conservation Strategy for that region (Ewert et al. 2006). Cornell Lab of Ornithology is leading a multi-agency Coordinated Bird Monitoring project (<http://www.nebirdmonitor.org/>) for the Northeastern U.S. The USGS Patuxent Wildlife Research Center has developed a Bird Point Count Database (<http://www.pwrc.usgs.gov/point/>); bird point count and transect data can be entered over the internet and archived indefinitely. They have recently upgraded their database to capture objectives, sampling design, and other essential metadata as well as generate reports. Many states have initiated Bird Conservation Initiatives (<http://www.wisconsinbirds.org/plan/species/priority.htm>) and are following up with their state's Wildlife Action Plan (<http://www.wildlifeactionplans.org/>). All of these developments provide hope that future passerine monitoring will have clear objectives and the partners will achieve coordination of data collection and analysis.

Who will use the protocol?

This protocol is suitable for use by land managers who wish to monitor bird species abundance, occupancy, and population trends on their lands. A standardized monitoring protocol for passerines will streamline monitoring plans for land managers and help ensure that data can be shared among refuges, parks, and other partners as well as have value for future meta-analyses designed to assess regional or national status and trends of bird populations or examine habitat relationships at large spatial scales. The Principal Coordinator (PC) is the lead ecologist for implementing this monitoring protocol at a station or group of stations.

Protocol organization and process for revision

The protocol is organized into an Introduction and a set of 11 SOP's (Figure 1). The Introduction is a general overview of the protocol that gives the history and justification for breeding season monitoring on refuges and parks and an overview of the sampling methods. The SOPs are the specific instructions for performing a given task. Over time, revisions to both the Introduction and to specific SOPs are to be expected.

Careful documentation of changes to the protocol, and a library of previous protocol versions are needed to maintain consistency in data collection, and for appropriate treatment of the data during data summary and analysis. All versions of the Introduction and SOPs will be archived in a Protocol Library. The USGS Bird Point Count Database contains a field that identifies which version of the protocol was being used when the data were collected. SOP #11, 'Revising the Protocol' outlines the steps for changing the protocol (either the Introduction or the SOPs). Each SOP contains a SOP Revision History Log that explains the changes and assigns a new Version Number to the revised SOP. We plan to cooperate with the Natural Resource Monitoring Partnership (<http://nrmp.nbio.gov/portal/server.pt>) by recording the protocol on that public site.

Passerine Bird Monitoring Protocol Guide to Standard Operating Procedures

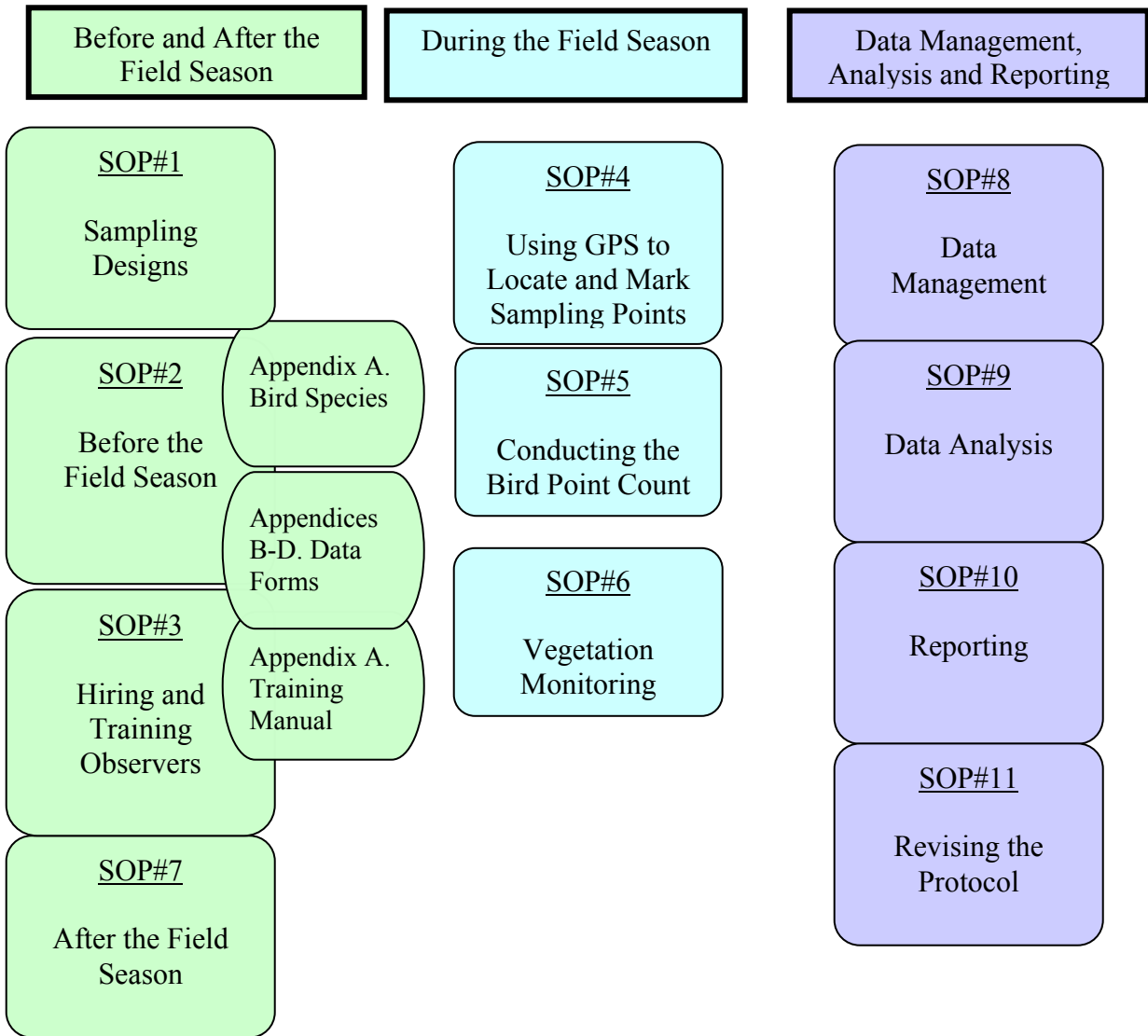


Figure 1. Flow chart of Standard Operating Procedures for the Passerine Bird Monitoring Protocol, Version 2.0.

II. Sampling Designs and Methods

Many different sampling approaches have been used to quantify status or trends in bird populations and many different monitoring programs are currently in place throughout North America to determine local, regional, or national trends in bird numbers (U.S. Geological Survey 2007). A single sampling design cannot meet all the needs of public land managers. Therefore, we've added a separate SOP (#1, Sampling Designs) to the protocol that describes different sampling designs and monitoring objectives appropriate to the wide range of situations that land managers face. Our goal is to develop several sampling designs suitable for sampling passerine species inhabiting both large and small management units. This SOP will evolve over time as we address specific monitoring needs and we bring in the needed expertise (statisticians and ornithologists) to design sampling approaches to meet those needs. The diversity of objectives and sampling designs make it more efficient to address them in a separate SOP; it will also facilitate adding new sampling designs or modifying old ones.

The protocol samples birds during 10-minute point counts with data grouped by distance interval and detection times (Farnsworth et al. 2005). In practice, this method is very similar to point counts used in the Breeding Bird Survey (BBS) (Peterjohn 1994) except that horizontal distance estimates and more detailed time accounting are employed. Point counts are useful in patchy habitats and in dense, rugged or hazardous terrain where you need to watch your footing as you walk. Another advantage of point counts is that data can be directly compared to historical point count data, including BBS counts. This protocol will allow direct comparisons with (historical) data collected using the BBS or Ralph et al. (1995) methods.

Raw counts of individual birds need to be adjusted for detection probability to accurately estimate densities (Nichols and Conroy 1996; Pollock et al. 2002). The data collected using this protocol meet minimal requirements for analysis using distance sampling and time-depletion (removal) methods (Farnsworth et al. 2005). SOP# 5 (Conducting the Bird Point Count) provides details on how to conduct point counts. When we conduct a point count, we are attempting to get an "instantaneous count" of birds present. The method takes into account the fact that birds close to the observer have a higher probability of being detected than birds far from the observer. Distances are estimated within several distance bands from the monitoring point. These distance bands are a compromise between estimating the exact distance to each bird and using only 1-2 distance bands or none at all. From an operational standpoint, we suggest employing range-finders during training and in the field. In addition, observers will record the one-minute time period associated with each bird observation for purposes of using the time-depletion (removal) method of data analysis (Farnsworth et al. 2005). This is relatively simple to record and allows the data analyst to group times together in an optimal way, depending upon objectives.

There are other ways to estimate detection probabilities for bird observations, including conducting multiple visits within a season (Mackenzie and Royle 2005) and counts by two observers visiting a point simultaneously (Nichols et al. 2000). Both methods are more costly than using distance estimation or the removal method because of the need for at least two trained bird observers working together or the need to repeat visits to a single point. This protocol requires visiting sampling points only once within the breeding season, but does not preclude the

use of either multiple visits or double observers if the PC deems it necessary. The database will accommodate entering double observer and/or multiple visit information. Repeating visits on small management units will help increase the species list and increase power.

If occupancy is the metric of interest, a minimum of three revisits to a point are required within a single breeding season (Bailey and Adams 2005; MacKenzie et al. 2006). Further research is needed to determine whether abundance or occupancy is the optimal metric to address specific management objectives. For taxa that cannot be counted with any confidence, but repeated visits can be used to estimate detection probabilities (salamanders), occupancy is the favored metric (MacKenzie et al. 2006).

Population being monitored

The population being monitored by the protocol is the community of passerine species in the study area during the breeding season or a selected subset of that community. It is important to record the target bird species in the sampling design to avoid confusion during the data analysis. For example, you can't calculate total community species richness if you only sampled a subset of the species in the community. For surveys of the entire bird community, we will record all bird species seen or heard during the point count surveys and during travel to sampling points, but we will remove all raptors, shorebirds, and waterfowl recorded on point counts before analyses because our sampling methods do not adequately sample these taxa.

The taxonomy of families, genera, and species as well as common and scientific names used follow the 7th edition of the American Ornithologists' Union (AOU) Checklist of North American Birds, including changes made in the 42nd, 43rd, 44th, 45th, 46th, and 47th Supplements to the Check-list, as published in *The Auk* 117: 847-858 (2000); 119:897-906 (2002); 120:923-932 (2003); 121:985-995 (2004); 122:1026-1031 (2005); 123:926-936 (2006).

III. Field Methods

Field season preparations

The PC will select a sampling design (SOP # 1, Sampling Design) before the field season begins and will consult the Regional Refuge Biologist or Network Coordinator to verify that the sampling design will meet the defined management and monitoring objectives.

Each two-person field crew for the passerine monitoring project consists of one observer, who conducts the actual survey, and one recorder, who records the detections of the observer on standardized data sheets. If budget or other constraints limit the field crew to a single observer, it is possible to carry out the protocol, although more difficult. Observers working alone in the field also present some safety considerations; they are more vulnerable if an accident occurs.

The PC and all field crew members will review this entire protocol, including all of the SOPs before the field season. The PC will pay close attention to the tasks described in SOPs (Before the Field Season) and (Hiring and Training Observers). Training is particularly important each year, as the misidentification of a species is a serious error, more serious than errors in estimating distances or double-counting a bird. All of the equipment and supplies listed in SOP #2 (Before

the Field Season) will be organized and made ready for the field season, and copies of the field data forms (SOP #5, Conducting the Bird Point Count) will be printed.

The PC will schedule sampling dates and organize logistics before the start of each field season. Unpredictable weather and other logistics necessitate maintaining some flexibility in scheduling the sequence and duration of sampling trips. If survey locations are spread latitudinally or along an elevation gradient such that breeding commences earlier in some locations than others, sampling will occur first in locations with earlier breeding phenology.

Sampling methods

Sampling locations are physically marked on the ground using permanent plot markers. Refer to SOP #2 (Before the Field Season) and SOP #4 (Using GPS to Locate and Mark Sampling Points) for navigation between sampling plots and plot establishment instructions.

The bird crew will arrive at the refuge or park a few days before the first day of sampling to familiarize themselves with the area and the birds present and to complete any mandatory on-site training. The PC will determine beginning and ending dates for surveys.

Vegetation monitoring

One objective of passerine monitoring is to assess how bird communities (composition, distribution, and abundance) respond to changes in landscape structure and vegetation. Large-scale changes in vegetation are likely to have cascading effects on avian communities. Therefore, an important component of the passerine monitoring program is measuring the response of passerine populations to changes in their habitat.

The PC is responsible for selecting an appropriate habitat monitoring protocol, based on the specific objectives of the bird monitoring program. In some situations, vegetation data is being collected by another agency or another field crew for another purpose. It may be possible, depending upon objectives, to co-locate bird sampling sites with vegetation sampling sites to maximize efficiency. At a minimum, the PC will train field staff to record land cover classes at each point each year using the classes defined by the USGS National Land Cover Database (NLCD) 2001 (Homer et al. 2004). If this basic habitat information is missing, the bird data is reduced in long-term value.

IV. Data Management

Database design

Passerine data will be entered into the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center's Bird Point Count Database (<http://www.pwrc.usgs.gov/point/>). This database accommodates bird point counts, transect, and area search methods and is open to any agency (federal, state, NGO) that chooses to contribute data. The database has recently been upgraded to improve the recording of metadata, including information about objectives, sampling design, sampling frame, point groupings (habitat or management unit) and target season. Simple summary reports are also available with plans to expand reporting and download capabilities in the future. USGS adheres to federal requirements for data quality and integrity. See SOP # 8

(Data Management) for details regarding data entry, verification, and editing, metadata procedures, and archival procedures.

At this time, the USGS Bird Point Count database does not accommodate the collection of data via handheld devices (PDA's); all data will be entered via web-based data entry. In many habitats, high bird densities preclude the use of handheld devices because of the need to quickly record a large number of bird observations.

V. Data Analysis and Reporting

SOP #9 (Data Analysis) contains details about the data analysis associated with the passerine monitoring program. The data analysis has four main objectives; details regarding management and sampling objectives are outlined in SOP #1 (Sampling Designs):

1. Conducting basic summaries of the data, intended for use in quality control and annual reporting.
2. Estimate bird species detection probabilities, densities, or occupancy, depending upon management objectives.
3. Conduct analyses of bird habitat relationships.
4. Conduct analyses of long-term trends for individual species and changes in the composition of bird communities over time.

USGS Patuxent Wildlife Research Center's Bird Point Count Database (<http://www.pwrc.usgs.gov/point/>) has simple reporting functions such as species richness or relative abundances of species, based on defined groupings such as refuge, habitat type, or management unit. In addition, the database has download functions. More advanced analyses (e.g. densities and abundances based on detection functions) will need to be conducted under the supervision of the PC or contracted to someone deemed competent to perform the analysis. Budget estimates should include funding to analyze the data, if time or capacity does not reside in-house.

VI. Personnel Requirements and Training

Roles and responsibilities

The PC must be proficient at or contract with others to: (1) train observers, (2) implement the study protocol in the field, (3) supervise data entry and quality assurance, (4) analyze the data, and (5) report results.

The PC's supervisor will vary depending upon the organization undertaking the monitoring; the PC supervises biological technicians and other field crew members. Depending upon the scale of the monitoring effort, one or more field crew leaders may be hired and will report to the PC. Because of the need for a high level of training and consistency in implementing the protocol, the PC will oversee the hiring and training of the field crews and, when possible, will be one of the persons conducting at least some of the point counts annually.

The PC will delegate functions such as preparing all field gear and data collection equipment, supplies, and data forms for the field season, entering field data into the Bird Point Count

database and cleaning, repairing, and storing field equipment to the appropriate staff. Cooperative Agreements with Bird Observatories, Audubon Clubs, or contractual agreements are possible sources of staff or volunteers with bird identification and other skills. USGS Science Centers and Universities have statisticians, quantitative ornithologists, and students that may be available to help with data analysis and reporting.

The data management aspect of the monitoring effort is the shared responsibility of the PC and the USGS Patuxent Wildlife Research Center's Bird Point Count Database. Typically, the PC is responsible for data collection, data entry, data verification and validation, as well as data summary, analysis and reporting. Before leaving the field each day, data sheets are checked for completeness and readability. All information pertinent to the plots sampled that day is recorded to avoid repeating or skipping sampling plots. The PC is responsible for the safekeeping and organization of the data sheets, and ensuring that data are entered into the database.

The Patuxent WRC is responsible for data archiving, data security, dissemination, and database design. Patuxent, in collaboration with the PC, also develops data entry forms and other database features as part of quality assurance and automates report generation. The Patuxent WRC is responsible for ensuring that adequate QA/QC procedures are built into the database management system and appropriate data handling procedures followed; the PC is responsible for ensuring that data entry and proofing procedures meet quality standards.

Qualifications and Training:

The SOP # 3 (Hiring and Training Observers) provides details on hiring and training all personnel associated with the passerine monitoring program. The competent observer is the essential element in the collection of credible, high-quality data on birds. Observer bias is a major source of bias in trend analyses of bird populations (Sauer et al. 1994; Kendall et al. 1996). Training has been shown to improve the ability of observers to detect birds (McLaren and Cadman 1999). Recordings of birds in the study area, especially for the less common or unexpected species, will be provided for observers.

Good hearing ability is essential because many birds, particularly in forested habitats, are detected by sound only. Observers must be capable of identifying the majority of birds ($\geq 90\%$) likely to be encountered by both sight and sound. Additionally, volunteers must be proficient at estimating abundance of birds detected and their horizontal distance from the observer. Volunteers must also be capable of hiking from 2-5 km over variable terrain (depending on park and transect route), and arriving at their study site(s) by 0500 hrs on survey mornings.

VII. Operational Requirements

Annual workload and field schedule

The sampling period for breeding birds will be defined by the PC to coincide with the peak in breeding activities for the passerine birds in the study area. Two-person field crews are strongly recommended, although one person could conduct the field sampling. The time required for sampling depends on the number and location of the points. Expect to sample 8-15 points in good weather with favorable walking terrain. The number of points sampled per day often decreases in steep or rugged terrain or if large mammals (bears, bison, moose) are encountered.

Facility, equipment, and budget

The nature of bird survey work does not require special facilities beyond normal office space and equipment storage needs. SOP # 2 (Before the Field Season) contains a list of the equipment needed by survey crews.

The PC will develop a budget for implementing this protocol to meet their objectives (example: Table 2). Field costs will vary depending on logistics. Travel costs include travel to field sampling sites and per diem. Startup costs for equipment include the purchase of equipment and supplies, as well as maintenance and or replacement of equipment shared among multiple projects (e.g. GPS units, cameras).

Table 1. Example budget estimating the costs of conducting 200 variable circular plots annually in all park units of the Central Alaska Monitoring Network in 2004 (2-person crews & some aircraft support).

Estimated Costs^a	DENA^b	WRST	YUCH	TOTAL
Salaries and Contracts	35,400	22,300	22,300	80,000
Travel (including field work)	8,000	8,000	8,000	24,000
Equipment	300	1000	1000	2,300
Supplies	500	500	500	1,500
Total	44,200	31,800	31,800	107,800

^a Note that a budget for data analysis is not included in this example, but should be considered when designing the monitoring plan.

^b Includes one GS-07 biological technician who is responsible for overseeing the field work and data entry for all three parks.

VIII. Acknowledgements

The following persons served on the National Wildlife Refuge System User Acceptance Team that reviewed existing passerine monitoring protocols and recommended a protocol to meet refuge field station needs.

- Karen Westphall (R3 Refuges)
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- Holly Gaboriault (R5 Refuges)
- Harold Laskowski (R5 Refuges)
- Tom Will (R3 Migratory Birds)
- Randy Dettmers (R5 Migratory Birds)

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**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #1
DRAFT**

Sampling Designs

Version 2.0 (April 2007)

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1.0	Oct 2004	McIntyre et al.	Sampling design in Introduction	Multiple sampling designs required separate SOP
2.0	Nov 2006	Knutson, et al.	New SOP	

This SOP provides options for sampling designs to be used with bird point counts for purposes of surveying grassland, forest, and shrub nesting passerines during the breeding season. This SOP is new and includes one sampling design (#4) derived from the Passerine Monitoring Protocol for the Central Alaska Network (McIntyre et al. 2004). Multiple options for sampling designs were needed because Refuges and Parks in the rest of the U.S. are much smaller in area than their counterparts in Alaska and have different management objectives that necessitate different sampling designs. Several resources that describe basic sampling designs were used in developing this SOP (Cochran 1977; Thompson 2002; Hill et al. 2005).

The Principal Coordinator for the survey should work with his/her supervisor and Regional Refuge Biologist 3-6 months prior to beginning the survey to define management and sampling objectives and select the appropriate sampling design to meet their needs. There may be technical resources available to assist in generating a set of points that meet the sampling design criteria. The form at the end (Appendix A) is used to record the details of the sampling design as part of the monitoring plan. Appendix B is a worksheet for documenting the metadata for the USGS Bird Point Count Database.

Species of management concern

Because many management objectives focus on a condition or change in the status of specific species, it will be necessary to define a subset of passerine species *a priori* that will serve as focal species for management. Scientific reasoning, coupled with statistical analyses of inventory or pilot data are used to identify appropriate focal species for future monitoring. These species may have one or more of these attributes:

- a) closely associated with major habitat types under management (habitat specialist or indicator species);
- b) classified as a species of management concern by Partners in Flight, NABCI, or USFWS Migratory Birds. Refuges with completed Comprehensive Conservation Plans or Habitat Management Plans will have identified their resources of concern and management priorities (U.S. Fish and Wildlife Service 2007); and
- c) detected with sufficient frequency that the sampling objectives are likely to be attainable with available resources.

Target population and sampling frame

Important issues to consider in a monitoring plan are the target population and the sampling frame. The target population is what you are interested in learning about (which passerine birds inhabit my refuge or management unit Z?) The sampling frame is that population of sampling units (typically locations) that most closely approximates the target population and that has some possibility of being sampled (entire Refuge, management unit Z, all grassland habitats on the Refuge, etc.). All monitoring plans should clearly define the target population in the objectives and define the sampling frame in the sampling design (Appendix A) so that it is clear to which area or population the summary information applies. A fundamental rule of sampling design is that you can't extrapolate your results to locations that had no opportunity to be sampled. For example, perhaps large areas of your target area are inaccessible due to the presence of unexploded ordnance (military weapons). You might be very interested in the birds that breed in those locations (target population), but if those areas are not in the sampling frame (no possibility of being sampled), then you can't attribute your results to those areas. You should be able to describe your sampling frame and create a map, blocking out any areas that were not in the sampling frame. It is rare that your sampling frame will encompass your entire population of interest; your sampling design is the best representation of the population of interest that you can achieve, given logistical and resource limitations.

Objectives

The sampling designs in this SOP can be used to address several potential management objectives, all of which employ estimates of bird abundance and occupancy. The specific objectives of a monitoring plan for a Refuge should be explicitly stated before undertaking the monitoring. The objectives below are a template for expressing management objectives and the associated monitoring objectives; they should be modified to match the management objectives of the Refuge (Elzinga et al. 2001). Various resources are available to guide you in defining clear management objectives (Elzinga et al. 2001; Adamcik et al. 2004; Butler and Koontz 2005; Arkema et al. 2006; Schroeder 2006; Mahan et al. 2007).

- 1) **Conduct an inventory of passerine bird species, estimating their abundance, density, or occupancy. The objective is to estimate the status of all passerine bird**

species in the target habitat. For this objective, sample the largest number of points in the target habitat that you can, regardless of the size of the land unit. For the smallest land units, we simply want an inventory and some estimate of variance from which to estimate sample sizes for future monitoring. Thus, if the unit will only accommodate 10 points, we still sample the 10 points. For the largest land units, the more points sampled, the higher the probability of detecting a large proportion of the species present.

- a) Management objective: I want to create a species list for the refuge or management unit Z and I want to estimate the abundance (birds/point), density (birds/ha), or the probability of occupancy (proportion of sites occupied) of a set of passerine bird species in the years 2005-2006. I want pilot data adequate to estimate the sample sizes needed to meet future management objectives (2- 4 below).
 - b) Sampling objective: I want to be 80% confident that the abundance/density/occupancy estimates for species present are within 20% of their respective true values.
- 2) **Detect change in abundance, density, or occupancy of passerine species.** For this objective, monitoring may be conducted over long time periods (5-10 years).
- a) Management objective: I want to be aware of a 50% decrease in the abundance (birds/point), density (birds/ha), or occupancy (proportion of sites occupied) of species X from 2000 to 2005 on management unit Z.
 - b) Example Sampling objective: I want to be 80% certain of detecting a 50% decrease in the abundance/density/occupancy of species X from 2000 to 2005; I am willing to accept a 20% chance of inferring a change when a nontrivial change did not take place.
- 3) **Detect change in community composition of passerine species.**
- a) Management objective: I want to be aware of a 20% decrease in the species richness of passerine bird species from 2000 to 2005 on management unit Z.
 - b) Sampling objective: I want to be 80% certain of detecting a 20% decrease in species richness of passerine bird species from 2000 to 2005; I am willing to accept a 20% chance of inferring a change when a nontrivial change did not take place.
- 4) **Evaluate achievement of a species target or threshold in abundance, density, or occupancy, usually in response to management actions.**
- a) Management objective: Through management actions, I want to increase species X to an abundance of 0.4 birds/point or the probability of occupancy to 40% from 2000 to 2005 on management unit Z.
 - b) Sampling objective: I want to be 80% confident that the abundance and/or occupancy estimates for species present are within 20% of their respective true values.
- 5) **Monitor bird abundance, density, or occupancy as part of an adaptive management process.** This objective is used only if a specific management action or decision is framed as part of an adaptive management process (Schreiber et al. 2004). Adaptive management is a systematic approach for improving resource management by

learning from management outcomes (U.S. Department of the Interior 2006). Adaptive management requires five elements: objectives, potential management actions, models of system response to management actions, measures of confidence in the models, and a monitoring program that assesses achievement of objectives and updates the models (Nichols and Williams 2006). Over time, the resource manager learns which management actions have the highest probability of achieving the stated objectives, given key system variables.

- a) Management objective: I want to estimate the abundance (birds/point), density (birds/ha), or the occupancy of a set of passerine bird species in 2005 on management unit Z after applying management action H. These metrics will be used to update confidence measures for a set of competing models that predict bird community responses to specific management actions or decisions. These confidence measures will help me decide among alternative management actions in the future.
 - b) Sampling objective: I want to be 80% confident that the abundance/density/occupancy estimates are within 20% of the true value as a starting point; the minimal accuracy of my estimates need only be accurate or precise enough to distinguish among my competing predictive models. If my competing models require more accuracy or precision than I can reasonably obtain, given the size of the management units or available resources, then I should reconsider using these metrics and explore other monitoring metrics that will have the needed accuracy and precision. Another alternative is to re-define my set of competing models.
- 6) **Explore habitat or other factors that may contribute to changes in abundance, density, or the probability that a site is occupied by a species.** This objective requires defining *a priori* a set of competing models to explain expected changes in bird abundance or occupancy and then collecting data on the environmental variables defined in the models. Expected change can be anticipated based on stressors, plant succession, management actions, climate change, etc.
- a) Management objective: Identify habitat or other factors associated with high vs. low abundance/density/occupancy of species X for the time period, 2000 to 2003 on management unit Z.
 - b) Sampling objective: Develop an appropriate and limited set of competing models and collect the associated habitat variables along with the bird data. Identify the best-fitting models that explain variation in abundance, density, or occupancy. This requires careful planning so that the habitat data are designed to meet the objectives; consultation with a statistician during the design phase is recommended.

Revisiting sampling points

Raw counts of individual birds and estimates of species richness need to be adjusted for detection probability to obtain accurate bird density estimates (Nichols and Conroy 1996; Pollock et al. 2002). The data collected using this SOP meet minimal requirements for analysis using distance sampling and time-depletion (removal) methods (Farnsworth et al. 2005); this allows us to revisit sampling points only once within the breeding season. However, if occupancy is the metric of interest, a minimum of 3 revisits to a point are

required within a single breeding season but counts of individuals are not required (Bailey and Adams 2005; MacKenzie et al. 2006). A species need only be recorded as present or absent at a point. However, count data can always be collapsed to presence/absence, but the inverse is not true; we suggest recording the count of individual birds even if occupancy is the desired metric. Further research is needed to determine whether abundance or occupancy is the optimal metric to address specific management objectives. For taxa that cannot be counted with any confidence, but repeated visits can be used to estimate detection probabilities (salamanders), occupancy is the favored metric (MacKenzie et al. 2006). Repeating visits on small management units that don't accommodate at least 50 points will help increase the species list and increase power.

Panel designs that allow some points to be revisited annually and other points to be revisited in rotation > 1 year apart may be advantageous for long-term monitoring (McDonald 2003). Statistical consultation is advised before implementing a panel design. Design #4 (below) uses a panel design to define the timing of revisits.

Spatial considerations

Our sampling methods employ digital (GIS) maps of the study area. We recommend using the best available land cover maps. Some refuges and parks have detailed land cover maps and those are preferred; alternatively, we use the National Land Cover Database (NLCD) 2001 maps when more specific maps are not available. We use 300 m between sampling points to avoid double-counting because our protocol allows recording birds farther than 100 m from the observer. The minimum recommended distance between land bird sampling points is 250 m (Ralph et al. 1995). Survey points should avoid edges (within 50 m of target habitat edge) only if the objective focuses on bird estimates within a specific habitat type. Refuge-wide surveys and surveys of species that are known to occupy edges should include edge habitats.

Design #1 Random design, for small to large land units

Objectives:

This sampling design addresses Objectives 1-6 above, and is suitable for small to large land units (< 5,000 ha) when most of the target sampling frame is accessible.

Design:

1. Impose a randomly-placed 300 m grid over land unit (entire refuge or management area).
2. Select all grid cells with > 60% of the target passerine habitat (define land cover classes to be included).
3. Randomly select 50-100 of these points to sample (more is better). If 50 cells is the target, select 50 primary + 20 replacement cells to sample (over-sampling).
4. Locate the centroid of these cells and generate a set of points for mapping and to upload into a hand-held GPS unit.
5. Overlay roads, trails, and other elements that allow access to target land cover class (define for each refuge). This information is used to determine access points.

6. Surveyors attempt to navigate to the primary sampling cells (points) (e.g., cells 1 to 50); if they cannot reach a primary cell for logistical reasons, replace it with the next cell on the list (e.g., cell 51); repeat as necessary until the full complement of cells are sampled.
7. To remove edges: If surveyors reach a sampling point that does not contain at least a 50 m radius circle of the target land cover class surrounding the point, the point is sampled and is labeled 'edge' on the data sheet. The surveyor moves on to the next point and uses replacement (see above) to acquire data for at least 50 points that are not 'edges'. Theoretically, edge points could be screened out using the digital map by employing a rule that the entire 300-m cell must fall within the land cover class boundary; however, many maps are not accurate enough to do this without field reconnaissance. It will save survey time if all the points can be ground-truthed and the edge points eliminated, if necessary, before the field season.
8. The sampling frame is the set of 300 m grid cells containing >60% of the target passerine land cover class and this area can be explicitly mapped.

Design #2 Stratified random design, stratified by access, for small to large land units

Objectives:

This sampling design addresses Objectives 1-6 above, and is suitable for small to large land units (< 5,000 ha) when large areas of the target sampling frame are very difficult to access and linear features (roads, trails) characterize all accessible areas. Stratification is by access. If parts of the target sampling frame are permanently inaccessible for safety or other reasons (unexploded ordnance, technical climbing required, frequent illegal activity), remove those cells from the sampling frame entirely. Use this design (#2) if roads or trails characterize the accessible areas. Use Design #1, with inaccessible cells removed, if access is not limited to roads or trails.

Design:

1. Impose a randomly-placed 300 m grid over entire refuge or management area.
2. Select grid cells with > 60 % of the target passerine land cover classes.
3. Overlay roads, trails, and other elements that allow access to target land cover classes (define for each refuge).
4. Classify 300 m cells as accessible if they intersect the above features (roads) (Class 1) or difficult to access if they don't (Class 2).
5. Select Class 1 sampling units: Extract a line coverage that represents all accessible paths (roads, trails); employ a sampling program that defines a set of points along the line coverage, with all points at least 300 m apart in all directions. Randomly select 50-100 of these points to sample. If all sampling points are on-road, distances between sampling points should be increased to 1 km (0.5 mi.) to cover more area (Ralph et al. 1995).
6. Select class 2 sampling units: Buffer the accessible line coverage 300 m, select all Class 2 cells that do not intersect the buffer. Locate the centroid of these cells and

- randomly select 10 primary + 5 replacement Class 2 cells to sample. These are numbered 1-15.
7. Surveyors attempt to navigate to the primary (#1-#10) Class 2 sampling cells; if they cannot reach a primary cell for logistical reasons, they replace it with #11, and repeat as necessary until ten, Class 2 cells are sampled.
 8. To remove edges: If surveyors reach a sampling point that does not contain at least a 50 m radius circle of the target land cover class surrounding the point, the point is sampled and is labeled 'edge' on the data sheet. The surveyor moves on to the next point and uses replacement (see above) to acquire data for at least 50 points that are not 'edges'. Theoretically, edge points could be screened out using the digital map by employing a rule that the entire 300-m cell must fall within the land cover class boundary; however, many maps are not accurate enough to do this without field reconnaissance. It will save survey time if all the points can be ground-truthed and the edge points eliminated, if necessary, before the field season.
 9. The sampling frame is the set of Class 1 and Class 2 grid cells containing >60% of the target passerine land cover class and this area can be explicitly mapped.
 10. A statistician can use the Class 1 and Class 2 designations to check for bias in the Class 1 data set and to allow extrapolation to the sampling frame. Thus, the sampling frame at the local scale is the set of Class 1 and Class 2 cells across the refuge or management area and this area can be explicitly mapped.

Design #3 Stratified random design, stratified by habitat type, for small to large land units

Objectives:

This sampling design addresses Objectives 1-6 above, and is suitable for small to large land units (< 5,000 ha) when most of the target sampling frame is accessible. In this design, the objective is to stratify by a factor relevant to your management objective, such as habitat type (land cover class) when you are concerned that a simple random sample might miss or under-sample a sub-set of that factor (rare habitat type). Sometimes other factors, such as land ownership, may be of stronger interest than habitat type. With a simple random sample, it is likely that habitats that are small in area relative to other habitats may, by chance, have too few samples or none at all. Stratification solves this problem. There are two basic ways to sample from strata: the number of samples is proportional to area or the number of samples in each strata are equal. If the objective is to obtain habitat-specific estimates of abundance or occupancy, then equal sample sizes in each target habitat are recommended. If the objective is to obtain multi-habitat estimates, then sample sizes in proportion to area, with a minimum of 30 points per habitat are recommended.

Habitat types change over time due to plant succession, disturbance, etc. Your sampling time frame should be short enough to avoid strata changing from one habitat type to another, as this will greatly complicate analysis of the data (Mahan et al. 2007). Use permanent characteristics (elevation, bedrock geology) to establish strata if you will be sampling over long time periods.

Design:

1. Impose a randomly-placed 300 m grid over entire refuge or management area.
2. Select grid cells with > 60 % cover of the target passerine habitat (define land cover classes).
3. Classify 300 m cells by the dominant target land cover classes (Habitat 1, Habitat 2, etc.).
4. Independently, randomly select some number of points (more is better) in each land cover class, with some replacements if some cannot be accessed or fall on an edge. If 50 cells is the target, select 50 primary + 20 replacement cells to sample in Habitat 1; do the same for the other target land cover classes. You can choose to allocate the samples proportional to the size of the land cover class or you could sample equal numbers of points in each land cover class.
5. Locate the centroid of the selected cells and generate a set of points for mapping and to upload into hand-held GPS unit.
6. Overlay roads, trails, and other elements that allow access to target land cover class (define for each refuge). This information is used to determine the best access points.
7. Surveyors attempt to navigate to the primary (#1-#50) Habitat 1 sampling cells; if they cannot reach a primary cell for logistical reasons, they can replace it with #51; repeat as necessary until 50 cells are sampled.
8. To remove edges: If surveyors reach a sampling point that does not contain at least a 50 m radius circle of the target land cover class surrounding the point, the point is sampled and is labeled 'edge' on the data sheet. The surveyor moves on to the next point and uses replacement (see above) to acquire data for at least 50 points that are not 'edges'. Theoretically, edge points could be screened out using the digital map by employing a rule that the entire 300-m cell must fall within the land cover class boundary; however, many maps are not accurate enough to do this without field reconnaissance. It will save survey time if all the points can be ground-truthed and the edge points eliminated, if necessary, before the field season.
9. Repeat steps 5 – 9 for remaining land cover class until all the target land cover classes are sampled.
10. The sampling frame is the set of Habitat 1 + Habitat 2 + Habitat X.... cells across the refuge or management area and this area can be explicitly mapped.

Design #4 Multi-stage probabilistic design, stratified by accessibility, for large land units

Objectives:

This sampling design addresses Objectives 2, 3, and 6 above, and is limited to very large land units (> 10,000 ha), where large areas of the target sampling frame are very difficult to access, and the target population is the entire refuge.

Design:

This sampling design is modified from a sampling design by Roland et al. (2003) that was used by the National Park Service in Denali National Park (McIntyre et al. 2004).

- 1) Impose a randomly-placed grid (macro-grid) over entire refuge or management area (Stage 1). (The size of the macro-grid can be scaled to the size of the overall management unit; many units may be well served by a grid with cells 10 km on a side.)
- 2) In the south-east corner of each macro-grid, generate a mini-grid consisting of a 5 X 5 lattice of 25, 500 m cells (Stage 2).
- 3) Overlay roads, trails, and other elements that allow access to sample points (define for each refuge).
- 4) Extract a line coverage that represents all accessible paths (roads, trails); buffer the accessible line coverage 500 m.
- 5) Classify mini-grids as accessible if they intersect the buffer (Class 1) or remote if they don't intersect the buffer (Class 2).
- 6) Randomly select 50 primary Class 1 mini-grids and 10 secondary mini-grids to sample. These are numbered 1-50.
- 7) Locate the centroid of each cell in the primary mini-grids (25 points) and conduct the point count. If one or more points in the mini-grid are inaccessible, mark that on the data sheet and conduct as many as possible. If more than 5 points within a mini-grid are inaccessible, replace the mini-grid with # 41. Continue until you have sampled 50 Class 1 mini-grids, each with 20+ accessible points.
- 8) Randomly select 10 primary + 5 replacement Class 2 mini-grids. These are numbered 1-15.
- 9) Surveyors attempt to navigate to the primary (#1-#10) Class 2 mini-grids; if they cannot reach a primary mini-grid for logistical or safety reasons, they can replace it with #11; repeat as necessary until ten, Class 2 mini-grids, each with 20+ accessible points are sampled. In Denali NP, helicopters are usually required to reach Class 2 sampling points.
- 10) If possible, it is best to ground-truth the sampling points before the field season to finalize the set of Class 1 and Class 2 mini-grids.
- 11) For long-term monitoring (10 + years), a panel design should be used (Table 1).
- 12) The sampling frame is the full set of Class 1 and Class 2 mini-grids and these can be explicitly mapped.
- 13) The sampled set contains 50, Class 1 and 10, Class 2 mini-grids. Each panel contains two Class 1 mini-grids. Panel 1 is surveyed every year, Panels 2-7 are surveyed in two consecutive years every 4 years, and Panels 8- 20 are surveyed once every 12 years. The 10 Class 2 mini-grids are sampled as in Panel 8 (the first year and every 12 years thereafter); this concentrates helicopter use to once every 12 years.
- 14) A statistician can use the Class 1 and Class 2 designations to check for bias in the Class 1 data set and to allow extrapolation of sampling results to the sampling frame. Thus, the sampling frame at the local scale is the set of Class 1 and Class 2 cells across the refuge or management area and this area can be explicitly mapped. Panel designs will require statistical consultation during the planning and analysis phases of the survey.

Table 1. Proposed sampling rotation for passerine monitoring using a multi-stage design, Denali National Park and Preserve, Alaska for 24 year period starting in 2005.

Panel	Sampling Occasion																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	X	X					X	X					X	X					X	X
3		X	X					X	X					X	X					X
4			X	X					X	X					X	X				
5				X	X					X	X					X	X			
6					X	X					X	X					X	X		
7	X					X	X					X	X					X	X	
8	X													X						
9		X													X					
10			X													X				
11				X													X			
12					X													X		
13						X													X	
14							X													X
15								X												
16									X											
17										X										
18											X									
19												X								
20													X							

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Appendix A. Sampling Design Summary

Section 1. Contacts (name, address, e-mail)

1. Date completed	2. Region	3. Regional Biologist
4. Refuge Supervisor	5. Refuge Name	6. Refuge Project Leader
7. Refuge Biologist	8. Principal Survey Coordinator	
9. Study title		

Section 2. Description of sampling

10. Management objective	
11. Sampling objective	
12. Target population	
13. Sample frame	
14. Survey design	
15. Stratification	
16. Expected sample size	
17. Over-sample	
18. Panels	
19. Nested sub-sample (multi-stage)	
20. Intensive areas	
21. Sample details	
22. Description of statistical analysis	
23. Literature Cited	
24. List of sampling points (attach a table with coordinates and a map)	

Appendix B. *STUDY DESIGN WORKSHEET – Bird Point Count Database*

Use this worksheet to gather info for the web-based form.

◄◄ = **information is required**. Other fields are optional, but collecting more information now will create a better long-term reference for you and others!

1. Create *STUDY*

Enter a brief name to describe new study: ◄◄

e.g. "Long-term monitoring" or "Burn control study 2003".

Adopt a Regional program for my use:

e.g. "Region 5 Grassland Study" or "Lower Mississippi Valley JV Pop Monitoring"
(You can pick one from the drop-down box on the web form if applicable.)

2. Study Description

Years for Field Work:

start: ◄◄ end:

URL for study description:

(please also fill in description.)

Purpose (select all that apply): ◄◄

- Baseline Inventory
- Long-term trend monitoring
- Bird-habitat associations
- Assess management effects
- Monitor species of interest
- Other

Purpose Details:

(400 char. max)

Citation Guiding Your Study Design (select one): ◄◄

- No citation (E.g. pilot study)

[] Enter a citation

Year: First author: (format: Smith, J)

Other authors:
(format: A. Wilson, S. Baird, and B. Patch)

Citation:

(format: Distance counts for dummies. Auklet 15:112-140.)

Brief study description (details not covered anywhere above):

(2000 char. Max – note that if one is written already, you may copy and paste it into the web form.)

3. Sampling

Sampling Frame Type (select one): ⚡

- | | |
|--|---|
| <input type="checkbox"/> Single land unit, selected habitats | <input type="checkbox"/> Multiple land units or refuges |
| <input type="checkbox"/> Single land unit or refuge | <input type="checkbox"/> State or regional |
| <input type="checkbox"/> Waterfowl Production Area | <input type="checkbox"/> National |
| <input type="checkbox"/> Wetland Management District | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Watershed | |

Sampling Frame Details (scope / area covered by study):

(200 char. max – in case some details are not covered by the broad categories above.)

Point Sampling (select one): ⚡

- | | |
|--|--|
| <input type="checkbox"/> Systematic (e.g. grid) | <input type="checkbox"/> Stratified random (e.g. by habitat) |
| <input type="checkbox"/> Systematic along transect | <input type="checkbox"/> Convenience sampling |
| <input type="checkbox"/> Random | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Random along transect (irregular) | |

Season (select one): ⚡

- | | |
|---|--|
| <input type="checkbox"/> Breeding | <input type="checkbox"/> Spring and fall migration |
| <input type="checkbox"/> Winter | <input type="checkbox"/> Regular through year (e.g. monthly) |
| <input type="checkbox"/> Spring migration | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Fall migration | |

Survey Frequency (select one):

- | | |
|---|---|
| <input type="checkbox"/> Once a season | <input type="checkbox"/> More than three times a season |
| <input type="checkbox"/> Twice a season | <input type="checkbox"/> Intermittent years |
| <input type="checkbox"/> Three times a season | <input type="checkbox"/> Variable |

4. Field Methods

Survey type: ⚡

- Point Count Area Search Transect Count

Protocol ID: ⚡

(Get one from the list of protocols attached.)

If your protocol is not listed, please contact Mark Wimer at mwimer@usgs.gov / 301-497-5596)

Count Restrictions (select one): ⚡

- Sky (e.g. rain or fog cancels)
 Temperature (too hot/cold)
 Noise (e.g. cars/water noise)
 Multiple restrictions (e.g. sky and noise)
 Unknown

Time of Day (use actual times for validation; select one): ⚡

- Must count after start time
 Must complete counts by end time
 Must count between specified times:
 Unknown / no set rules

start after:
e.g. sunrise, 5:00

end by:
e.g. midday, 13:00

Field Sheet URL:

(We would appreciate receiving a copy if it's easy to send us one. Thanks!)

List of Protocols – Point Count, Area Search, and Transect Count with examples

I. Point Count (a total of 66 listed):

	One time interval	Two time intervals	Three time intervals
One radius	(59) 3min w/ unlimited distance (BBS)* (46) 5min w/ 100m (30) 5min w/ unlimited distance (20) 10min w/ unlimited distance (65) 5min w/ unlimited distance & flyover (also breed & hab)	(6) 3,5min w/ unlimited distance (3) 3,6min w/ unlimited distance (birds re-counted) (55) 3,6min w/ unlimited distance & flyover	
Two radii	(43) 3min w/ 50,>50m (44) 5min w/ 50,>50m (68) 5min w/ 50,>50m & flyover (also breed)	(8) 3,5min w/ 50,100m (69) 3,5min w/ 50,100m & flyover (13) 3,5min w/ 50,100m & flyover by time (37) 3,5min w/ 50,>50m (NWRS R5 Landbird) (45) 3,5min w/ 50,>50m & flyover by time (9) 3,5min w/ 50,>50m & flyover by time (also breed) (10) 3,5min w/ 50,>50m & assoc. and ind. flyovers by time (also breed) (64) 3,5min w/ 50,>50m & flyover by time (also det type & sex) ** (36) 3,5min w/ 100,>100m (NWRS R5 Grassland Bird) (48) 3,5min w/ 100,>100m & flyover (14) 5,8min w/ 50,100m & flyover** (25) 5,10min w/ 50,100m (18) 5,10min w/ 50,100m & flyover (52) 5,10min w/ 50,100m & flyover by time (15) 5,10min w/ 50,100m & flyover by time (also breed-hab)** (11) 5,10min w/ 50,100m & flyover, outside 100m (27) 5,10min w/ 50,>50m & flyover (70) 5,10min w/ 100,>100m	(40) 3,5,10min w/ 50,100m (1) 3,5,10min w/ 50,100m & flyover (33) 3,5,10min w/ 50,100m & flyover by time (12) 3,5,10min w/ 50,>50m & assoc. and ind. flyovers by time (35) 3,5,10min w/ 50,>50m (50) 3,5,10min w/ 50,>50m & flyover (47) 3,5,10min w/ 50,>50m & flyover by time (62) 3,5,10min w/ 50,>50m (also det type) ** (67) 3,5,10min w/ 50,>50m & flyover by time (also det type) (38) 3,5,10min w/ 100,>100m (29) 5,8,10min w/ 50,100m & flyover by time**
Three radii	(31) 5min w/ 25,50,>50m & flyover (53) 5min w/ 100,200,>200m & flyover	(19) 3,5min w/ 25,50,>50m (32) 3,5min w/ 25,50,>50m & flyover by time (2) 3,5min w/ 50,100,>100m & flyover (73) 5,8min w/ 50,100,>100m & flyover by time (also breed, habitat, & det type)** (28) 5,10min w/ 25,50,>50m (26) 5,10min w/ 25,50,>50m & flyover (34) 5,10min w/ 25,50,100m & flyover by time (24) 5,10min w/ 50,100,>100m (23) 5,10min w/ 50,100,>100m & flyover	(41) 2,4,5min w/ 50,100,>100m (54) 2,4,5min w/ 50,100,>100m & flyover (39) 3,5,10min w/ 25,50,>50m (49) 3,5,10min w/ 25,50,>50m & flyover (4) 3,5,10min w/ 25,50,>50m & flyover by time (16) 3,5,10min w/ 25,50,100m & flyover by time (42) 3,5,10min w/ 50,100,>100m (51) 3,5,10min w/ 50,100,>100m & flyover (74) 5,8,10min w/ 50,100,>100m & flyover by time (also breed, habitat, & det type)**
Four radii	(22) 3min w/ 25,50,100, >100m & flyover		(21) 3,5,10min w/ 25,50,100,>100m & flyover

Other: (17) 0-3,4,5,6,7,8,9,10min w/ 100m (also det type & sex) **
 (57) 3,5,7.5min w/ 10,25,50,75,100,>100m & flyover by time (also det type, age, & sex) **
 (66) 3,5,10min w/ distance estimation **
 (72) About 2hr nocturnal playback area search (also breed, habitat & det type)**

II. Area Search (a total of 1 listed):
 (58) 20min, 3 ha. area search

III. Transect Count (a total of 1 listed):
 (56) 2min, 20x100m transect

*The protocol ID is included in parentheses followed by the time intervals and count radii as well as any other columns, such as flyover columns, used for the protocol. So, "(59) 3min w/ unlimited distance (BBS)" means that the ID for this protocol is 59, its only time interval is 0-3min, and its count radius is unlimited. This protocol also happens to be used for the North American Breeding Bird Survey (BBS).

**Time intervals, count radii, etc. are not provided as column headers but are selected from a list or are entered manually for individual birds.

Examples – how protocols are displayed in online survey forms:

(35) 3,5,10min w/ 50,>50m

CommonName	3min			5min		10min		Notes	Options
	50m	Gt50m	Fly	50m	Gt50m	50m	Gt50m		
BWWA Blue-winged Warbler	2						1		Delete
GWWA Golden-winged Warbler				1					Delete

(50) 3,5,10min w/ 50,>50m & flyover

CommonName	3min			5min		10min		Fly	Notes	Options
	50m	Gt50m	Fly	50m	Gt50m	50m	Gt50m			
BWWA Blue-winged Warbler	2						1			Delete
GWWA Golden-winged Warbler				1				1		Delete

(47) 3,5,10min w/ 50,>50m & flyover by time

CommonName	3min			5min			10min			Notes	Options
	50m	Gt50m	Fly	50m	Gt50m	Fly	50m	Gt50m	Fly		
BWWA Blue-winged Warbler	2							1			Delete
GWWA Golden-winged Warbler			1		1						Delete

(62)* 3,5,10min w/ 50,>50m (also det type)

CommonName	TimePeriod	Distance	ObservationType	Count	Options
BWWA Blue-winged Warbler	0-3min	<50m	Ind Seen	2	Delete
BWWA Blue-winged Warbler	5-10min	>50m	Singing	1	Delete
GWWA Golden-winged Warbler	3-5min	>50m	Calling	2	Delete

(67) 3,5,10min w/ 50,>50m & flyover by time (also det type)

CommonName	3min			5min			10min			DetType	Notes	Options
	50m	Gt50m	Fly	50m	Gt50m	Fly	50m	Gt50m	Fly			
BWWA Blue-winged Warbler	2							1		S		Delete
GWWA Golden-winged Warbler			1		1					V		Delete

Also, columns can be grouped by distances – e.g., for protocol (35):

CommonName	50m			50plus			Notes	Options
	3min	5min	10min	3min	5min	10min		
BWWA Blue-winged Warbler	1					1		Delete
GWWA Golden-winged Warbler					1			Delete

**Passerine Monitoring Protocol for
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**Standard Operating Procedure (SOP) #2
DRAFT**

Before the Field Season

Version 2.0 (April 2007)

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Revision History Log:

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.		
2.0	April 2007	Knutson, et al.	Updated	Protocol revised

The Principal Coordinator (PC) and crew leaders for the bird surveys will review this entire protocol, including all the SOPs, several months before surveys begin. All crew members will be issued a copy of this protocol during the pre-survey training. Several weeks will be required for crew leaders to prepare for the training session and organize field gear.

The PC will pay particular attention to hiring and training observers for this project (SOP # 3, Hiring and Training Observers). Bird identification and distance estimation is extremely important; accurate identification of birds by sight and sound is essential. The training sessions will prepare observers to accurately estimate distances to all types of bird detections.

Procedures:

1. General Preparation and Review:

1.1. Review introduction and all SOPs in the bird monitoring protocol. Understand the goals and procedures of the monitoring program and begin preparations for the training period and field season.

- 1.2. Discuss the season's plans with supervisor and Regional biological support staff.** Select sampling design (SOP #1) and establish sampling points, develop timeline and field schedule, and outline responsibilities of individual crew members.
- 1.3. Review field notes and trip reports from past sampling.** Identify any unique species or conditions (hazardous routes, missing markers, etc.) that may be encountered.
- 1.4. Print and review the species list (SOP #5, Conducting the Point Count, Appendix A.)**
 - 1.4.1. Review the species most likely to be encountered.
 - 1.4.2. The Regional Bird Conservation Tool (http://umesc-ims01.er.usgs.gov/website/new_bird/viewer.htm) can be used to generate a bird species list based on historical data from BBS routes surrounding the refuge. Use the HELP button to obtain instructions.
 - 1.4.3. Crew members will carry copies of the species list in the field, printed on the backside of grid maps, to use as a quick reference for identification.
- 1.5. Generate a list of point coordinates for all points to be surveyed.** See SOP #1 (Sampling Designs) and SOP #4 (Using the GPS to Locate and Mark Sampling Points). Include GIS-generated points for new points and a list of the actual marker coordinates for previously sampled points.
- 1.6. Print and laminate maps of point locations for each crew member.** Laminate grid maps with the Bird Species List (SOP #5, Appendix A) on the backside and with the best available land cover map or rectified aerial photo of the study area on the front.
- 1.7. Print and copy the field data forms.** The field data forms in SOP #5 (Conducting the Point Count). Printed these onto Rite-in-the-Rain[®] paper (if available) and produce 30+ copies of the Field Data Form—Circular Plots, and 30+ double-sided copies of the Field Data Form—Bird Point Count.
- 1.8. Upload waypoints onto the GPS units.** Waypoints (the latitude and longitude coordinates for each survey point) may be uploaded via computer into all GPS units before the start of the field season (SOP #4, Using the GPS).
- 1.9. For grids that have been sampled in the past, print a list of the *actual* point coordinates.** See SOP #4 (Using GPS) for a description of this process. Also produce a list of the point sequence and times of surveys.
- 1.10. If this is the first year of your survey, establish a new study in the USGS Bird Point Count database** <http://www.pwrc.usgs.gov/point/>. You will be ready to enter data once you have established a new study and entered your metadata into the database. (See SOP #1 Sampling Designs, SOP #4 Using the GPS, and SOP #8 Data Management.)
 - 1.10.1. Contact your Regional Coordinator (<http://www.pwrc.usgs.gov/point/main/mainPage.cfm?formName=113>) for

instructions or take one of the online trainings offered by your Regional Coordinator.

2. Scheduling Field Work:

2.1. Establish the survey schedule. Breeding bird surveys will focus on the time period that coincides with the peak breeding activity of most passerine species in the study area, usually late May through the end of June. The Principal Coordinator will establish the survey time period. Crews generally spend the last two weeks of May in training and the month of June conducting surveys.

2.1.1. Sampling schedules often change due to weather events. It is wise to plan for weather days throughout the month and always have a backup plan.

2.1.2. Under good conditions, crews can sample from eight to 14 points a day.

3. Organizing Supplies and Equipment:

3.1. Compile an equipment inventory before the field season.

3.2. Organize and prepare all field equipment several weeks before commencing field work. Table 1.01.1 summarizes the list of field equipment; Table 1.01.2 summarizes the equipment required for marking permanent plots. All equipment should be examined for functionality and completeness before field work begins.

Table 1.01.1 List of field equipment for point counts

Number Required	Item Description
	Waterproof binoculars (10 x 40)
	Compasses (with mirrors and clinometers)
	Celsius (0-50 degrees) Thermometers
	Handheld laser rangefinders (10-200+ meter range)
	Handheld GPS units for navigation. Current recommendation: Garmin GPSMap76Cx http://www.thegpsstore.com/Garmin-GPSMAP-76Cx-Color-Handheld-GPS-P879C78.aspx Manual: UserGuide_GPS_Map76CSx.doc
	Bird Field Guides
	Rite-In-the-Rain [®] spiral field notebooks
	Field Data Form- Bird Point Counts data form (printed on Rite-in-the-Rain [®] paper)
	Field Data Form- Circular Plot data forms (printed on Rite-in-the-Rain [®] paper)
	Clipboards (recommended: metal with storage area)
	Laminated grid maps with waypoint coordinates list on back of map.
	Topographic or other maps
	Digital camera with extra batteries and storage cards
	CD Players (water-proof sport model)
	Bird songs of Alaska CD by Leonard J. Payton; Cornell Lab. of Ornithology
	Hand-held walkie-talkie radios (for communication between teams)
	Hand-held park radio for communication with Com-Center (with extra batteries)
	First Aid Kits
	Extra write-in-the-rain pens
	Extra batteries (for radios, GPS, rangefinders, etc.)

Number Required	Item Description
	Rolls of flagging (for marking points, gear that might be lost, etc.)
	Canisters of bear spray, if needed
	Digital timer with clip (example: http://www.indoorhealthproducts.com/100ms.htm)

Table 1.01.02 List of additional field equipment required for marking permanent survey points.

Number Required	Item Description
	Rubber mallet
	Survey marker stakes
	Permanent sampling point survey marker caps (stamped with point numbers)
	Measuring tapes (at least 5 meters long)

4. Suggested reference manuals for bird surveys:

- 4.1. Baicich, Paul J., and Colin J. O. Harrison. 1997. *A Guide to the Nests, Eggs, and Nestlings of North American Birds*. Academic Press, San Diego, CA.
- 4.2. Sibley, David Allen. 2003. *The Sibley Field Guide to Birds of Eastern (or Western) North America*. Alfred A. Knopf, New York, New York.

5. Data Forms:

- 5.1. See SOP # 5, Conducting the Bird Point Count

**Passerine Monitoring Protocol for
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**Standard Operating Procedure (SOP) #3
DRAFT**

Hiring and Training Observers

Version 2.0 (April 2007)

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Revision History Log:

Version #	Date	Author	Changes Made	Reason for Change
1.0	March 2007	Faccio, et al.		
2.0	April 2007	Knutson, et al.	Modified	Adapt for Refuges

This Standard Operating Procedure explains recruitment of observers and training requirements. This SOP is adapted from a protocol developed for the National Park Service, Northeast Temperate Network (Faccio and Mitchell 2007).

1. Recruiting Observers

- 1.1. The Principal Coordinator (PC) is responsible for recruiting observers either by hiring or attracting volunteers. Observers can be recruited from a variety of local sources, including bird clubs, Audubon Chapters, birding listserves, and via state BBS coordinators.
- 1.2. Verifying potential participants' bird identification skills is very important. Hearing ability is fundamental to bird identification because a large proportion of birds are heard but not seen.
 - 1.2.1. It is reasonable to ask potential observers to have a hearing test, if possible; hearing loss that exceeds 20 dB will compromise the ability to effectively survey passerines (Kepler and Scott 1981).
- 1.3. Many bird monitoring programs rely on word-of-mouth recommendations of local birders as well as self-evaluation.
 - 1.3.1. Vermont has developed a simple, self-administered, online auditory Bird Identification Quiz to help determine if potential observers have necessary skills to participate in bird monitoring (http://www.vinsweb.org/cbd/FBMP_Quiz.html).
 - 1.3.2. Wisconsin has developed a more extensive Birder's Certification Program (<http://www.uwgb.edu/birds/certification/index.htm>) that is useful for stations in Wisconsin and neighboring states with similar habitats.
 - 1.3.3. We support online training and testing and hope that it can be extended

geographically and taxonomically. It is ideal if potential employers and bird observers themselves can evaluate and improve birding skills in an objective way well before the field season begins.

- 1.3.4. Cooperative, multi-agency (live) training sessions for passerine observers may also be developed in the future but are not available at present.

2. Visual and Auditory Identification of Birds

- 2.1. The most essential component for the collection of credible, high-quality bird data is well-trained and experienced observers. Proficient bird observers obtain species estimates within 90% of total species known to be present and estimate abundance within 80% accuracy (Ralph et al. 1993). Various studies have shown that observer bias is one of the most noteworthy bias factors in trend analysis of songbird populations (Kepler and Scott 1981; Baker and Sauer 1995).
- 2.2. The PC is responsible for training observers at the station before surveys begin. A minimum of one week of bird identification and survey training is recommended. If the station requires observers to have safety, first aid, or other training also, the PC should plan on a total of two weeks of training prior to beginning surveys.
- 2.3. The PC prepares a list of bird species likely to be encountered at each monitoring study area (SOP #5, Appendix A).
- 2.4. Observers must possess excellent visual and auditory bird identification skills, and should be capable of identifying 90% of the bird species likely to be encountered. Several months prior to the field season, observers should review and practice bird identification skills.
- 2.5. Regardless of skill level, birders should spend time in the field familiarizing themselves with the birds in the survey area prior to starting a survey.
- 2.6. Suggested reference materials for conducting bird surveys:
 - 2.6.1. Tapes or CDs of bird songs for species found in Eastern U.S.
 - 2.6.2. National Audubon Society Interactive CD-ROM Guide to North American Birds. This interactive CD-ROM is an excellent resource for learning calls, site ID and background information on bird species.
 - 2.6.3. National Geographic. 1987. Field Guide to Birds of North America, 3rd Edition. National Geographic, Washington, D.C. 480 pages.
 - 2.6.4. The Sibley Field Guide to Birds of Eastern North America. 2003. Alfred A. Knopf, New York.

3. Estimating Distances to Birds Seen or Heard

- 3.1. Refer to the paper “Reducing bird count variability by training observers” by Kepler and Scott (1981) for a detailed discussion of training observers to identify birds by sight and sound as well as training them to estimate distances.

- 3.2. In a habitat similar to the one in which you will be conducting point counts, begin by placing flagging at 10 m, 25 m, 50 m, and 100 m from a marked central point (e.g. the point count station). To do this, volunteers will either need a 25m (or longer) tape, a laser rangefinder, or a measured length of rope.
 - 3.3. Walk around the “study site” placing flagging at 4 or 5 locations visible from the station. Return to the central point and estimate the distance band (e.g. 0-10m, 10-25m, 25-50m, >50m) that each flag falls within, recording them in a field book. Then, using a measuring device, measure the distance to each flag and compare your initial estimate to the actual distance. Repeat this exercise several times until you can consistently estimate distances.
 - 3.4. The majority of birds are usually heard but not seen, and estimating distances to birds that are only heard is often the greatest source of error in point counts. Standing at the central point, listen for vocalizing birds. Choose one consistently vocalizing individual and estimate the distance band in which it is singing. Remember, the horizontal distance should be estimated, as if a plumb-bob was lowered to the ground from the bird’s location. Try to visually identify the tree or branch where you think the bird is, and estimate the horizontal distance to an object that can be seen directly below where you think the bird is vocalizing from. Now, with one end of your measuring device affixed to the central point, slowly walk toward the vocalizing bird until you can either see it or accurately estimate its location. Compare your initial estimate to the actual distance. Repeat this exercise for several birds at various distances.
4. **Training Program Topics.** The following section outlines the sequence of tasks to be completed during the training period.
 - 4.1. **Prepare for the training program.** Instructors and/or other assistants must prepare training materials, itineraries, field gear, and set up distances courses before the training program begins. Along with the training program, there are a variety of other tasks that will have to be completed in preparation for field work. Thus, it is crucial that instructors prepare well in advance, budget their time appropriately, and coordinate with each other.
 - 4.2. **Issue field gear before training begins.** See SOP #2, “Before the Field Season” for a list of field gear. Provide a copy of this protocol to all trainees, along with field gear and other training materials, before training begins. Ensure that crewmembers examine the list of necessary personal gear and that they have all the appropriate equipment by the time field work starts. Ensure that trainees are informed and prepared for the training and survey events; everyone should bring binoculars, raingear, rubber knee-boots, appropriate clothing, field guides, and other appropriate for equipment each day of training.
 - 4.3. **Review Bird Survey and Distance Estimation Methods (see above).** Observers from previous seasons normally do not need as much annual training in bird identification

skills as new observers. However, we recommend that all observers participate in training each year. Experienced observers can assist as additional teachers with less experienced trainees. Experienced observers will also continue practicing distance estimation, working on identification of birds by call notes, partial songs, and generally improving their identification skills.

4.3.1. New observers will be tested by accompanying a qualified observer along a route and simultaneously recording the birds detected. Alternatively, an examination may be given using a recording of bird vocalizations or bird vocalization software such as *Bird Master*[™] or *Bird Sounds Tutorial*[™].

4.4. Conduct training in habitats similar to those encountered during surveys. Conduct the majority of the training in habitats and topography similar to those encountered during surveys. While emphasizing distance estimation, point out as many birds as possible with the initial objective of maximizing the trainee's exposure to the species most likely to be encountered during the surveys. Discuss personal techniques for distance estimation, dealing with busy points, flyovers, moving birds, and potentially confusing scenarios, bird species and behaviors that are encountered in similar habitats.

4.5. Focus on distance estimation during the first days of training. The training session occurs immediately before the field season when most passerines are returning to breed. Emphasize distance estimation during the first days of training; emphasizing distance estimation early in the training session allows for the number of bird species to increase before the focus shifts to bird identification, maximizing efficiency. This also allows distance estimation practice to continue throughout the training period. Construct distance estimation training courses in a variety of habitats and topographical gradients.

4.6. Start training days early. Problems enumerating individual birds during the “dawn chorus” can lead to erroneous survey results. Thus, adjust the training time to best prepare observers, incorporating the peak singing time for most species. An early training time also allows crew members to become accustomed to waking up early, which will be crucial when the real surveys begin.

5. Other Aspects of Training

5.1. The PC will ensure that observers understand and are trained to use all the equipment and SOPs needed while they are in the field, including GPS navigation equipment, and emergency communication equipment (e.g., park radios or cell phones). Observers are encouraged to practice using navigation equipment and will also be encouraged to locate their point count sites during the day before their official counts. This will allow them to gain familiarity with survey locations and save time when they are conducting their counts.

6. References

Baker, R. J., and J. R. Sauer. 1995. Statistical aspects of point count sampling. Pages 125-130 in *Monitoring bird populations by point counts*. General Technical Report PSW-GTR-149

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- Kepler, C. B., and J. M. Scott. 1981. Reducing bird count variability by training observers. *Studies in Avian Biology* 6:366-371.
- Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of field methods for monitoring landbirds. USDA Forest Service General Technical Report PSW-GTR-144, Albany, CA. (<http://www.fs.fed.us/psw/publications/documents/gtr-144/>)

**Passerine Monitoring Protocol for
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**Standard Operating Procedure (SOP) #4
DRAFT**

Using GPS to Locate and Mark Sampling Points

Version 2.0 (April 2007)

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Revision History Log

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.		
2.0	April 2007	Sutherland, et al.	Combined SOP # 2 and 4	Simplify and generalize to most common GPS devices.

This SOP provides instructions for preparing maps and using a GPS to locate and mark sampling points associated with the bird point counts. This revised SOP #4 combines SOP#2 (Preparing maps from GIS) and SOP#4 (Using GPS); the original was developed for the Central Alaska Network (McIntyre et al. 2004). This SOP requires some expertise with ArcGIS. The survey crews will complete GPS training before field work begins. Upon completion of the training, all crew members are expected to know how to mark a point, enter new waypoint coordinates, and navigate to a waypoint using a GPS.

We strongly encourage stations to establish and mark their sampling points *before* the bird surveys begin. Leaf-off conditions will enhance the performance of your GPS units. More time and care can be taken in establishing the permanent marker and ensuring that it will be easy for the bird observer to find later. Fall or early spring (after the frost is out) are ideal times for this work.

Procedures:

1. Generate sampling points.

- 1.1. The Principal Coordinator (PC) will generate a GIS layer of sampling points using one of the sampling designs in the protocol (SOP #1, Sampling Designs) or work with the Regional Refuge Biologist or statistician to develop a custom sampling design.

- 2. Create a map of sampling points, overlaid on land cover map or a rectified aerial photo.**
 - 2.1.** The map should show useful landmarks that can be located on the ground by the observer.
 - 2.2.** Create a list of your sampling point locations using the UTM or Geographic (Latitude/Longitude) coordinate system referenced to either the horizontal datum of NAD83 or WGS84 (Appendix A). Be sure to specify the datum used and UTM zone if UTM coordinates are used. Each point must have a unique identification number.
 - 2.3.** Pre-print field data sheets with the GPS locations (see SOP #5, Conducting the Point Count).

- 3. Upload sampling points into GPS device.**
 - 3.1.** Use ArcGIS to identify the projection and datum being used by the GIS layer that contains your sampling points. If no metadata exists for this layer, contact the source who created the layer.
 - 3.2.** If the GIS layer that contains your sampling points is not employing the UTM or Geographic (Latitude/Longitude) coordinate system (referenced to either the horizontal datum of NAD83 or WGS84) use the “Project” tool in ArcGIS to change the projection and/or datum of the layer. Do not upload data into your GPS device from a GIS layer that is referenced to the horizontal datum of NAD27.
 - 3.2.1.** If you need to perform a datum transformation, see the following URL for information on choosing the correct transformation method for your geographic area:
<http://support.esri.com/index.cfm?fa=knowledgebase.techArticles.articleShow&d=21327>
 - 3.3.** Delete all existing waypoints in your GPS device.
 - 3.4.** Upload the sampling coordinates into your GPS device as waypoints. Do not manually enter the coordinate values by hand into the GPS device as many mistakes are likely. There is software available to automate the uploading process.
 - 1.1.1.** For Garmin GPS device users, a free software tool called DNRGarmin can be used. When using DNRGarmin to upload coordinates, be sure to use the SET PROJECTION function and specify the same coordinate system and datum used by the GIS layer in ArcGIS.
 - 1.1.2.** You can download the latest version of DNRGarmin from the following URL:
<http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html>

- 4. Navigate to the sample point, using GPS device.**
 - 4.1.** Ensure your GPS device is set to the same datum as the GIS layer used during the upload process in Section 3.
 - 4.2.** If applicable to your device, ensure the Wide Area Augmentation System (WAAS) capabilities are enabled.
 - 4.3.** Ensure your distance units are set to METERS.
 - 4.4.** Ensure your GPS device is turned on and remains stationary in an open area for at least 10 minutes before you start to use the device for navigation.
 - 4.5.** Select the desired waypoint you wish to navigate to and begin navigating to the waypoint.

- 4.6. As you approach the waypoint, verify that at least 4 satellites are being used to determine your current position (3D).
- 4.7. Once your distance to the waypoint is within 10 meters, you should begin looking for the permanent marker that identifies the location of the sampling point.
- 4.8. If this is the first visit to a new random sampling point, verify that your distance to the waypoint is within 5 meters, conduct the survey, and then establish a permanent marker at your current location after the bird survey has been completed. The PC should establish what to do if the observer cannot get within 5 meters of the waypoint. Options are returning another day to establish this waypoint as a permanent sampling point or moving the sampling point to avoid barriers (water, etc.) and recording the new coordinates as the permanent sampling point.

5. Mark sample point with permanent marker.

- 5.1. Use a metal tag or other permanent marker to mark the sampling location. The tag should be affixed to be visible and permanent, given anticipated disturbances to the site (flooding, burning, etc.). Metal stakes with bright paint and a permanent label are ideal but may not be appropriate in all situations. The PC will decide the most appropriate type of permanent markers to use.
- 5.2. Brightly colored flagging or paint will make the location easier to locate in the short term, but flagging rapidly degrades.
- 5.3. Record a description of the permanent marker location using bearings and distances from natural features. For example, use a compass and tape measure or range finder to determine the distance and azimuth to the permanent marker from a nearby natural feature such as a tree. Record this information in the *NOTES* section of Appendix A.

6. Use Appendix A to establish the location of your points in the USGS Bird Point Count database <http://www.pwrc.usgs.gov/point/>.

- 6.1. Contact your Regional Coordinator (<http://www.pwrc.usgs.gov/point/main/mainPage.cfm?formName=113>) for instructions or take one of the online trainings offered by your Regional Coordinator.

7. References

McIntyre, C. L., R. Drum, K. L. Oakley, E. Debevec, T. L. McDonald, and N. Guldager. 2004. Passerine bird monitoring protocol for the Central Alaska Monitoring Network: Denali National Park and Preserve, Wrangel-St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve, Alaska. U.S. Department of the Interior, National Park Service, Denali Park, AK. 33 pp.

Appendix A. Example Sampling Point Location Table
Identify Horizontal Datum Being Used: WGS84 or NAD83
UTM ZONE: 15

Sample Pt. #	Latitude_DD	Longitude_DD	UTM(Easting)	UTM(Northing)	NOTES
1	43.82169	-91.26671	639382	4853527	From Northern Red Oak tree, go 8.5 feet at a bearing of 186 degrees
2	43.82255	-91.26782	639291	4853621	
3	43.81996	-91.26706	639358	4853335	
4	43.81691	-91.26629	639427	4852997	
5	43.81424	-91.26377	639636	4852705	
6	43.81885	-91.26515	639514	4853215	
7	43.81785	-91.26418	639595	4853105	
8	43.81787	-91.26270	639713	4853110	
9	43.81581	-91.26146	639817	4852884	
10	43.81408	-91.26068	639884	4852692	
11	43.81216	-91.26290	639711	4852476	
12	43.81366	-91.26346	639662	4852641	
13	43.96902	-91.30264	636156	4869831	
14	43.96905	-91.30319	636112	4869834	
15	43.96886	-91.30259	636161	4869814	
16	43.96941	-91.30225	636187	4869875	
17	43.97779	-91.28964	637179	4870827	
18	44.02302	-91.32248	634443	4875796	
19	43.97774	-91.28917	637217	4870823	
20	43.93258	-91.25810	639815	4865858	
21	43.81991	-91.26394	639609	4853334	
22	43.82169	-91.26671	639382	4853527	

**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #5
DRAFT**

Conducting the Bird Point Count

Version 2.0 (April 2007)

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Revision History Log

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.	-	-
2.0	April 2007	Knutson, et al.	Modified for Midwest/ NE U.S.	Some aspects (wilderness prep) don't apply to us

This SOP provides step by step instructions for conducting 10-minute point counts for surveying passerines. This SOP also describes the procedure for collecting data and completing the “Field Data Form—Point Count” and “Field Data Form—Circular Plot” (included in Appendixes B, C, and D). This SOP was modified from the Passerine Monitoring Protocol for the Central Alaska Network (2004). The protocol is designed for one person (observer and recorder) or a two-person survey crew, consisting of an observer, who conducts the survey, and the recorder, who records the detections made by the observer. Details regarding sampling designs are found in SOP #1 Sampling Designs.

Procedures:

1. Before Surveys Begin:

1.1. If the plot, route, or grid has been sampled in the past, examine the point sequence and times of surveys. The sequence and times should remain consistent with the original sampling sequence.

1.2. Discuss the sequence and route with field staff. Determine the survey plan for field staff. Always plan to survey the maximum number of points possible each day and take advantage of good survey conditions.

1.3. Ensure the GPS unit is loaded with the appropriate coordinates. This should be done before entering the field. See SOP #4, “Using GPS to Navigate and Mark Waypoints”.

1.4. Review safety information relevant to your field situation. Review safety considerations with field staff, including extreme heat and cold, presence of disease-carrying insects, poisonous plants, operation of vehicles in off-road conditions, etc. Field staff should be equipped with food, water, rain gear, appropriate footwear, and a first aid kit, at a minimum.

1.5. Organize equipment. See tables 1.01.1, in SOP #1, “Before the Field Season”.

2. Weather and Time Considerations:

2.1. Consider weather conditions before leaving. When survey conditions are questionable, the primary consideration is the observer’s safety, followed by the ability to hear birds. High winds, heavy rain, or snow may prevent or delay surveys for several hours or even days. The surveys should be postponed if the weather is unacceptable for surveys. It may be necessary to assess survey conditions from the actual survey points, not from the departure point.

2.2. Discuss options for continuing surveys when weather is questionable. It may be necessary to go to the first survey points to determine if survey conditions are acceptable. The crew leader is responsible for deciding if conditions are unacceptable for surveys. Some form of communication among crews and with the office (cell or satellite phones, walkie-talkies) is recommended.

2.3. Record your float plan or field itinerary according to station protocols. At a minimum, record who is in the field crew, where you will be sampling that day, when you left, when you expect to return, and who is responsible for checking that you have returned. Record your field and home contact information (phone number or pager) for use if you don’t return.

2.4. Whenever possible, complete the entire plot, route, or grid before moving on to the next. Sample all accessible points on an entire plot, route, or grid before moving on.

2.5. Complete all surveys between 0.5 hr. before sunrise and 4 hr. after sunrise. Survey as many points as the time and weather allow each day. Arriving at a survey point on time often requires leaving your base 1.5 hr. before sunrise or earlier, depending on the time it takes to reach the first survey point. Be prepared with several extra data sheets (and markers, if applicable).

3. Conducting the Point Count and Recording Data:

- 3.1. Navigate to the survey point using a handheld GPS unit.** See SOP #4, “Using GPS Units to Navigate and Mark Waypoints”.
- 3.2. After arriving at a survey point, rest for at least one minute.** Resting for a minute allows the heartbeat to calm after hiking, and the observer to get oriented. If birds are observed flushing when the crew approaches the survey point, their original position in relation to the survey point should be noted and recorded during the first time interval.
- 3.3. Complete a new datasheet for each survey point.** During the pre-count period, the recorder will fill out the reverse side of the Point Count Data Sheet, recording all bird species detected between points. The observer then prepares a clipboard with the Circular Plot Data Sheet, along with a digital time, binoculars, laser rangefinder, and compass. If you are using a 2-person crew, the recorder will also use a clipboard and prepare the Point Count Data Form while the observer prepares to observe.
- 3.4. Conduct the point as a “snapshot” in time.** The survey results should represent the actual distribution of the birds relative to the point. The underlying theory of distance sampling requires that each point be recorded as close to a “snapshot in time” as possible. Some movement is acceptable, so long as a bird is only counted once and the observer does not cause movement. Any birds that flush upon approaching the point, or birds that seem to be attracted by the presence of the surveyors, should be noted in the comments.
- 3.5. Record all distances as the horizontal distance interval from the observer to the bird. Use a laser rangefinder to calibrate distance estimates.** To use distance sampling theory to analyze the data, it is critical that all distance estimations are the horizontal distance to each bird. The closer the bird, the more accurate the distance estimation should be (Buckland et al. 1993). Thus, pay particular attention to accurately recording the distance band (Table 6.07.01) of birds closest to the point. All individual birds are recorded the first time they are observed and assigned to a distance band (≤ 10 , 10-25, 26-50, 51-100, ≥ 101 -m). The observer should use a laser rangefinder to check the accuracy of their visual estimates of distances to fixed objects as needed or at least daily.
- 3.6. Use a digital timer to record the minute associated with each bird observation.** Small digital timers can be clipped to the clipboard. The observer records the minute (0, 1, 2, 3, ...9) during which each bird is first observed on the data sheet next to the species code. The first time period is coded ‘0’, since that is what the timer will indicate. This is relatively easy to do and later allows the data analyst to group times together in an optimal way.
- 3.7. If you are using a 2-person crew, announce all detections to the recorder in a clear yet quiet voice, including species, detection type, distance and direction.** The observer will stand at the survey point and announce each

detection to the recorder (for example “White-crowned Sparrow, singing, 125 meters, north”). The observer then marks the detection on the Circular-Plot Data Form to keep track of detections. The recorder records detections in the minute interval that the bird was first detected on the standardized data sheet. On the data sheet, the species is identified by its 4-letter AOU code, listed on the prepared Bird Species List (Example: Appendix A), for instance, “WCSP” for White-crowned Sparrow. All unknown birds, including unknown calls, should be recorded as “UNBI”, or as specifically as possible in the comments column (“unknown sparrow”, etc.). A list of species codes associated with the study area (Example: Appendix A) should be printed on the backside of a laminated grid map for each recorder/grid, and carried by the recorder. The recorder is responsible for informing the observer when the 10-minute period has ended.

- 3.8. For most species, record each individual bird as a separate observation.** For species that usually occur in clusters or flocks, the appropriate unit to record is the cluster or flock size, and not the individual bird.
- 3.9. Record ancillary data on the data sheet.** The recorder may record ancillary data (including temperature, weather, noise, vegetation etc.) while the observer prepares to conduct the point count, or after the point has been completed.
- 3.9.1. Vegetation/habitat variables should be recorded after the point count. See SOP #6 (Vegetation Monitoring) for instructions.
- 3.9.1.1. The only requirement for vegetation monitoring is to record the primary and secondary land cover class associated with the bird monitoring point, using the National Land Cover Database (NLCD) 2001 classes. This information will be permanently linked to the bird data at each point, by visit, in the National Point Count Database.
- 3.9.1.2. All other vegetation/habitat monitoring is optional.
- 3.10. Complete all fields on the datasheet before departing for the next point.** After a point count is completed, check that all fields have been completed on the datasheet. Any additional comments, particularly regarding factors that might affect the quality of the data should be recorded in the notes section. Describe subsequent detections in the “between points” section, on the reverse side of the data sheet.
- 3.11. Complete a datasheet for each point, even if no birds are detected.** If no birds were detected at a point, complete the ancillary data fields and note, “no birds were detected” in the comments to document that the point was surveyed.
- 3.12. Record observations of other fauna, including mammals, fish, and amphibians.** Record observations of other fauna including mammals, fish, amphibian, and invertebrates in the additional notes or notes sections on the data sheets. Identify detections to species if possible. Note other fauna-related objects including beaver dams, beaver lodges, insect hatches, etc.

- 3.13. Ensure that no equipment is left behind.** It is useful to attach brightly-colored flagging to or spray paint items like thermometers, binoculars, GPS units, and any other equipment that may accidentally be left behind or dropped between points.
- 3.14. Navigate to the next point.** Use the GPS to attain a bearing to the next point and hike to the next point at a reasonable pace. The pace between points should be fast enough to get a maximum number of points in days of good weather, but repeatable by other field crews in future surveys. Do not race to points. A good survey day may range from completing as few as 7 points to as many as 14 points in a day, depending on weather, topography, vegetation, and a variety of other factors.
- 3.15. Proof all data and update daily field notes after returning to base.** Include any birds seen later in the day, but not during the survey period, in the field notes.
- 3.16. Enter data into the USGS Bird Point Count (BPC) database (Refuges)** <http://www.pwrc.usgs.gov/point/>. If you are entering data from a new monitoring plan, the Principal Coordinator should contact the Bird Point Count Regional Data Coordinator. Each FWS Region has a BPC Data Coordinator who will issue the appropriate permissions to the Refuge Responsible Party. Here is the list of regional data coordinators: (<http://www.pwrc.usgs.gov/point/main/mainPage.cfm?formName=113>). See SOP #7 After the Field Season.

4. Field Descriptions for Point Count field data form:

- 4.1. Study Name:** Record the name of your monitoring effort; this name is used in the database to label all the point counts associated with this effort.
- 4.2. Grid/Plot/Route:** Record the unique plot, route or grid name.
- 4.3. Point:** Record the point number (1-25).
- 4.4. Date (mm/dd/yyyy):** Record the month (2 digits), day (2 digits), and year (4 digits) in the format shown.
- 4.5. Start (hhmm):** Record the time when the 10-minute point count begins: use military time and fill in all four digits. For instance, 0630 (6:30 am).
- 4.6. End (hhmm):** Record the time when the 10 minute point count ends; use military time and fill in all four digits. For instance, 0640 (6:40 am).

4.7. Temperature (°C): Record the ambient air temperature at the end of the count in degrees Celsius, rounded to the nearest degree. The thermometer should be placed above the ground and allowed to adjust to ambient air temperature.

4.8. Wind Speed (WS): Record the wind code (0-6) (Table 6.01.1) as it applies to the wind speed during the 10-minute point count. The average wind speed is recorded, rounded to the closest single number, not the maximum (gusts).

Table 6.01.1 Codes used to record wind strength during bird counts (Beaufort Scale)¹.

Wind Code	Wind Speed (miles/hr)	Description
0	< 1	Calm; smoke rises vertically
1	1-3	Light air; wind direction shown by smoke drift
2	4-7	Light breeze; wind felt on face
3	8-12	Gentle breeze; leaves in constant motion, light flag extended
4	13-18	Moderate breeze; raises dust; small branches move
5	19-24	Fresh breeze; small trees sway, crested wavelets on inland waters
6	25 or more	Strong breeze; large branches in motion

¹ These are the same codes used in the Breeding Bird Survey. Acceptable conditions for counting birds include a sky code of 0-2 and wind code 0-3.

4.9. Wind Direction (WD): Record the direction the wind is blowing from (N, S, E, W, NW, SW, NE, SE) during the 10-minute point count.

4.10. Sky Condition (Sky): Record the sky conditions as it applies during the 10-minute point count from Table 6.02.1.

Table 6.02.1 Codes used to record sky conditions during bird counts¹.

Sky Code	Description
0	Clear or a few clouds
1	Partly cloudy (scattered)
2	Cloudy (broken) or overcast
4	Fog or Smoke
5	Drizzle
7	Snow
8	Showers

¹ These are the same codes used in the Breeding Bird Survey. Acceptable conditions for counting birds include a sky code of 0-2 and wind code 0-3.

4.11. Background Noise: Record the background noise code (0-3) from Table 6.05.1 that describes the background noise conditions as it relates to the observer’s ability to hear birds.

Table 6.03.1 Codes used to record levels of background noise during bird surveys.

Background noise code	Description
0	No background noise
1	Barely reduces hearing
2	Noticeable reduction of hearing
3	Prohibitive (greatly reduced hearing)

4.12. Observer/Recorder (Obs/Rec): Record the 3-letter initials of the observer and recorder. Names and contact information for all observers and recorders are stored in the database.

4.13. GPS Lat/Long: Record the location (GPS coordinates) of the survey points using the UTM or Geographic (Latitude/Longitude) coordinate system referenced to either the horizontal datum of NAD83 or WGS84. Create data sheets with the sampling points and GPS coordinates pre-printed; recorders generally make mistakes recording numbers with many digits in the field.

4.14. Detection Type: Describes the type of detection associated with each bird, and may include more than one detection type.

Table 6.04.1 Codes used to record detection type during bird surveys.

Detection	Description
S	Singing
C	Calling
M	Male visual detection
F	Female visual detection
V	Visual detection, sex unknown
MF	Male/female pair--visual detection
A	Aerial detect
D	Breeding display
J	Juvenile
N	Nest

4.15. Distance (Category): Describes the distance category (in meters) of each bird detection. This distance should be the *horizontal* distance to each bird.

Table 6.05.01 Describes codes distance categories used for bird surveys.

Category	Distance
10	0-10 m
25	11-25 m
50	26-50 m
100	51-100 m
101+	> 100 m

4.16. Photos taken? Circle YES if photos taken at the survey point according to SOP#6 (Vegetation Monitoring). Circle NO if no photos were taken.

5. Data Forms:

Appendix A: Bird Species List (example)

Appendix B: Field Data Form—Point Count, back side

Appendix C: Field Data Form—Point Count, front side

Appendix D: Field Data Form—Circular Plot

Appendix A (Example). Bird Species with AOU Codes

This bird list will be customized by the Principal Coordinator prior to initiating surveys.
 Example: Truncated list of avian species present or expected in the Central Alaska Network parks, Alaska.

AOU Species Code	Common Name	Genus species	TSN
GWFG	Greater White-fronted Goose	<i>Anser albifrons</i>	175020
CAGO	Canada Goose	<i>Branta canadensis</i>	174999
TRUS	Trumpeter Swan	<i>Cygnus buccinator</i>	174992
GADW	Gadwall	<i>Anas strepera</i>	175073
AMWI	American Wigeon	<i>Anas americana</i>	175094
MALL	Mallard	<i>Anas platyrhynchos</i>	175063
CITE	Cinnamon Teal	<i>Anas cyanoptera</i>	175089
NOSH	Northern Shoveler	<i>Anas clypeata</i>	175096
NOPI	Northern Pintail	<i>Anas acuta</i>	175074
AGWT	American Green Winged Teal	<i>Anas crecca</i>	175081
CANV	Canvasback	<i>Aythya valisineria</i>	175129
REDH	Redhead	<i>Aythya americana</i>	175125
RNDU	Ring-necked Duck	<i>Aythya collaris</i>	175128
GRSC	Greater Scaup	<i>Aythya marila</i>	175130
LESC	Lesser Scaup	<i>Aythya affinis</i>	175134
SCSP	Scaup Sp.	<i>Aythya sp.</i>	
HARD	Harlequin Duck	<i>Histrionicus histrionicus</i>	175149
SUSC	Surf Scoter	<i>Melanitta perspicillata</i>	175170
BLSC	Black Scoter	<i>Melanitta nigra</i>	175171
WWSC	White-winged Scoter	<i>Melanitta fusca</i>	175163
LTDU	Long-tailed Duck (Oldsquaw)	<i>Clangula hyemalis</i>	175147
BUFF	Bufflehead	<i>Bucephala albeola</i>	175145
COGO	Common Goldeneye	<i>Bucephala clangula</i>	175141
BAGO	Barrow's Goldeneye	<i>Bucephala islandica</i>	175144
COME	Common Merganser	<i>Mergus merganser</i>	175185
RBME	Red-breasted Merganser	<i>Mergus serrator</i>	175187
RUGR	Ruffed Grouse	<i>Bonasa umbellus</i>	175790
SPGR	Spruce Grouse	<i>Falcapennis canadensis</i>	553896
WIPT	Willow Ptarmigan	<i>Lagopus lagopus</i>	175804
ROPT	Rock Ptarmigan	<i>Lagopus mutus</i>	175813
WTPT	White-tailed Ptarmigan	<i>Lagopus leucurus</i>	175827
STGR	Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>	175841
RTLO	Red-throated Loon	<i>Gavia stellata</i>	174474
PALO	Pacific Loon	<i>Gavia pacifica</i>	174475

Appendix B. Field Data Form—Point Count, back side, RAPID VEGETATION ASSESSMENT (FORESTS, Optional)

Tree Density (> 2.5 cm DBH)	Shrub Density (< 2.5 cm DBH)	Special Features	
1 None	1 <10 in 10m radius	1 Beaver flooding	7 Natural opening in site
2 <5 in 10m radius	2 11 to 100	2 Large downed logs	8 Rock outcrop
3 6 to 20	3 101 to 500	3 Small openings	9 Residual hardwood trees
4 21 to 40	4 501 to 1000	4 Snags	10 Residual conifer trees
5 >40	5 >1000	5 Wetland pocket in site	11 Residual patches
		6 Woodland pond in site	12 Roads, buildings

Vegetation Structure		COMMENTS
Canopy height (m)		
Tree Density (1 = few to 5 = dense) - 10 m radius		
Shrub Density (1 = few to 5 = dense) - 10 m radius		
High canopy cover (%)		
High canopy % deciduous (0% = all conifer)		
Subcanopy cover (lower layer of trees: %)		
Subcanopy % deciduous (0% = all conifer)		
Understory cover (3 ft to 12 ft: %)		
Understory % deciduous (0% = all conifer)		
Ground cover (3 ft to ground: %)		
Tree species (up to 5)		
Shrub species (up to 5)		
Special features (codes)		

Appendix C. Field Data Form—Point Count, front side
STUDY NAME: (2007 Bird Surveys : Green Acres NWR)

Circle Horizontal Datum Used: **WGS84** or **NAD83**

DETECTIONS

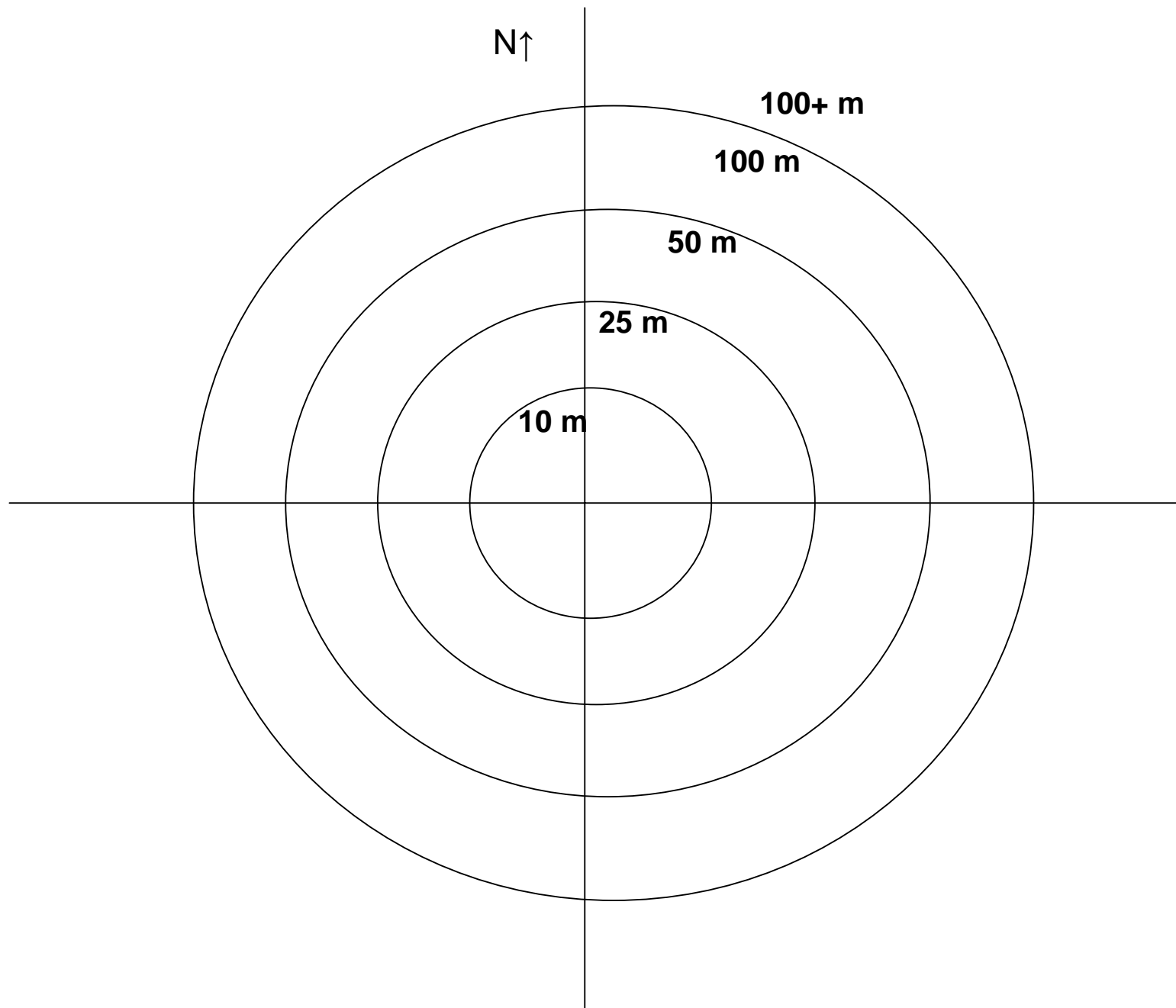
Plot/Route/Grid:	Obs:	Rec:	Obs.	SPECIES	TYPE	DIST.	MIN.	Comments
Pt:	Start:	End:	1					
Date:	GPS lat (northing):		2					
Background Noise:	GPS long (easting):		3					
Temp C: WS:	Aspect/slope:		4					
WD:	Other:		5					
Sky:	Photos taken? Yes No		6					
			7					
BACKGROUND NOISE CODES	DETECTION TYPE CODES		8					
0 No background noise	S Singing		9					
1 Barely reduces hearing	C Calling		10					
2 Noticeable reduction of hearing	M Male -visual detection		11					
3 Prohibitive (greatly reduced hearing)	F Female-visual detection		12					
	V Visual, sex unknown		13					
WIND SPEED (WS) CODES	MF Pair-visual detection		14					
0 Calm	A Bird flying over area		15					
1 Slight	J Juvenile		16					
2 Wind felt on face	N Nest		17					
3 Leaves in constant motion			18					
4 Raises dust; small branches move			19					
5 Small trees sway	DISTANCE CATEGORIES		20					
6 > 15 mph	10 0-10 m		21					
	25 11-25 m		22					
SKY CONDITION CODES	50 26-50 m		23					
0 Clear or a few clouds	100 51-100 m		24					
1 Partly cloudy (scattered)	100+ > 100 m		25					
2 Cloudy (broken) or overcast			26					
4 Fog or Smoke	NLCD 2001 LAND COVER CLASS		27					
5 Drizzle	#1		28					
7 Snow	#2		29					
8 Showers	Comments:		30					
			31					
ADDITIONAL SPECIES OBSERVED			32					
			33					
			34					
	IN OFFICE (date and initial):		35					
	Data proofed:		36					
	Data entered:		37					

Appendix D. Field Data Form—Circular Plot

Date:

Grid: XXXX

Pt.: XXXX



**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #6
DRAFT**

Vegetation Monitoring

Version 2.0 (April 2007)

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Revision History Log

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.		
2.0	April 2007	Knutson, et al.	Updated	Protocol revised

This SOP provides instructions for conducting vegetation monitoring associated with the bird point counts. This is a new SOP; the first Passerine Monitoring Protocol for the Central Alaska Network (2004) did not include a Vegetation Monitoring SOP. The protocol is designed to be implemented immediately after the bird point count, before the observer(s) leave the point. The only requirement for vegetation monitoring is to record the primary and secondary land cover class associated with the bird monitoring point, using the National Land Cover Database (NLCD) 2001 classes. This information will be permanently linked to the bird data at each point, by visit, in the National Point Count Database. All other vegetation monitoring is optional; we provide two optional protocols for a rapid vegetation/habitat assessment (Appendices B & C). We will work to standardize additional vegetation assessments in the future and provide MS Access Databases to archive the data.

We suggest that the observer take digital photographs of the vegetation at each point. Establishing a photographic record of vegetation is quicker and requires less training than recording vegetation metrics such as percent cover, tree diameter at breast height, etc. The low price and light weight of a simple digital camera makes it an inexpensive data logger. The strengths of repeated photographs in monitoring vegetation changes are: (1) a complete inventory of the landscape is captured in the picture; (2) vegetation change can be assessed qualitatively from an annual series of photos; and (3) the field portion of the process can be executed rapidly and easily. A weakness of repeated photographs in monitoring vegetation is that observable changes in species composition are limited to obvious species such as woody plant invasion, large herbaceous species replacing small species, etc.

Procedures:

1. Train field staff.

1.1. The Principal Coordinator (PC) will train field staff to recognize land cover classes at each point using the USGS National Land Cover Database (NLCD) 2001 (Homer et al. 2004) (Appendix A; http://www.mrlc.gov/nlcd_definitions.asp).

1.1.1. Other habitat measurements may be designed for specific purposes; a companion (MS Access) database will hold these additional habitat variables.

1.1.2. The justifications for using this set of land cover classes as the core required habitat variables are:

1.1.2.1. USGS will soon have a consistent national map of these land cover classes.

The classes encompass all the major habitats of interest with regard to passerine birds and include some agricultural and developed classes. At a minimum, each refuge will be able to overlay their refuge property boundaries on this map, no matter where they are located.

1.1.2.2. The other vegetation classification systems (NVCS, TNC's Ecological Systems) have deficiencies that, from a practical standpoint, require more training for the bird observers to record habitat at each point.

1.1.2.3. National Vegetation Classification System (NVCS) (<http://biology.usgs.gov/fgdc.veg/standards/vegstd.html>) is not exhaustive and works best for natural habitat systems. Many FWS owned lands are highly managed and manipulated and not in a natural vegetative state.

1.1.2.4. TNC's Ecological Systems are defined for each state/region and need to be downloaded from the Nature Serve website (<http://www.natureserve.org/explorer/index.htm>) (Comer et al. 2003). The classifications are detailed enough that intensive training is required for field staff to accurately record vegetation using this system. Agricultural cover and cultural land cover types are not defined.

2. Record land cover class (Required).

2.1. Record the name of land cover class and the associated number (11 – 99) at each bird monitoring point immediately after conducting the Bird Point Count. Recording at least one dominant land cover class at each point is required and will be permanently linked to the bird data at each point at each visit in the National Point Count Database. Record the data on SOP# 5, Appendix C. Field Data Form—Point Count, back side. Add comments, if desired.

2.1.1. Field 1: Primary land cover class (required)

2.1.2. Field 2: Secondary land cover class (record if the area within 100 m of the point has more than one land cover class)

2.1.3. Field 3: Comments

3. Take photographs at each sampling point (Optional).

3.1. Set the digital camera to record *.jpg images at minimum image resolution of 1260 X 990 pixels (approximately 14 X 11 inches; file size ≥ 500 KB) and to display date and

time information on the photos. Set the camera to use the ‘automatic’ focusing and exposure settings.

- 3.2. Stand at the center of the bird sampling point, close to the permanent marker (stake, tree, etc.).
- 3.3. Take the first photo by pointing the camera at an ID tag on the ground with the sampling location (Refuge, plot, point, and NLCD 2001 land cover class) marked on it and visible in the photo. Light blue or gray paper photographs better than white (less contrast & glare).
- 3.4. Take four additional photos of the vegetation surrounding the sampling point. While standing at the center of the bird sampling point, take one photo with the camera pointed in each cardinal direction (N, E, S, W, in that order) along a trajectory parallel with the ground, at a height that is eye level for the observer.
- 3.5. In the office, edit the digital images so that the Refuge, plot, point, direction, date, and NLCD 2001 land cover classification information are affixed permanently to the photos associated with that point (bottom left corner of the photo).

4. Record additional vegetation metrics (Optional).

- 4.1. You may consider collecting additional vegetation/plant community/habitat structure variables in association with your bird point counts. We recommend thinking carefully about your management objectives and how you will use the vegetation data to meet your objectives. See Appendices B & C for two examples of vegetation monitoring protocols used in association with bird point count data.
 - 4.1.1. Appendix B includes rapid vegetation measurements used by the University of Minnesota Natural Resources Research Institute (NRRI) with bird point counts in forested landscapes. NRRI has an MS Access database for these data and will make it available to refuges.
 - 4.1.2. Appendix C includes vegetation metrics designed by the FWS Region 5 Refuges’ Biology Program. The Region 5 Regional Refuge Biologists have an MS Access database for these data and will make it available to refuges.

5. Literature Cited

- Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kottel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: a working classification on U.S. terrestrial systems. NatureServe, Arlington, VA. 75 pp.
- Homer, C., C. Huang, L. Yang, B. Wylie, and M. Coan. 2004. Development of a 2001 National Landcover Database for the United States. Photogrammetric Engineering and Remote Sensing 70:829-840.

Appendix A. NLCD 2001 Land Cover Class Definitions
(http://www.mrlc.gov/nlcd_definitions.asp)

- 11. Open Water** - All areas of open water, generally with less than 25% cover of vegetation or soil.
- 12. Perennial Ice/Snow** - All areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover.
- 21. Developed, Open Space** - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes
- 22. Developed, Low Intensity** - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.
- 23. Developed, Medium Intensity** - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.
- 24. Developed, High Intensity** - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.
- 31. Barren Land (Rock/Sand/Clay)** - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
- 32. Unconsolidated Shore*** - Unconsolidated material such as silt, sand, or gravel that is subject to inundation and redistribution due to the action of water. Characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms representing this class.
- 41. Deciduous Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
- 42. Evergreen Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

43. Mixed Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.

51. Dwarf Scrub - Alaska only areas dominated by shrubs less than 20 centimeters tall with shrub canopy typically greater than 20% of total vegetation. This type is often co-associated with grasses, sedges, herbs, and non-vascular vegetation.

52. Shrub/Scrub - Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

71. Grassland/Herbaceous - Areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

72. Sedge/Herbaceous - Alaska only areas dominated by sedges and forbs, generally greater than 80% of total vegetation. This type can occur with significant other grasses or other grass like plants, and includes sedge tundra, and sedge tussock tundra.

73. Lichens - Alaska only areas dominated by fruticose or foliose lichens generally greater than 80% of total vegetation.

74. Moss - Alaska only areas dominated by mosses, generally greater than 80% of total vegetation.

81. Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

82. Cultivated Crops - Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

90. Woody Wetlands - Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

91. Palustrine Forested Wetland* -Includes all tidal and non-tidal wetlands dominated by woody vegetation greater than or equal to 5 meters in height and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent.

92. Palustrine Scrub/Shrub Wetland* - Includes all tidal and non-tidal wetlands dominated by woody vegetation less than 5 meters in height, and all such wetlands that

occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent. The species present could be true shrubs, young trees and shrubs or trees that are small or stunted due to environmental conditions.

93. Estuarine Forested Wetland* - Includes all tidal wetlands dominated by woody vegetation greater than or equal to 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.

94. Estuarine Scrub/Shrub Wetland* - Includes all tidal wetlands dominated by woody vegetation less than 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.

95. Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

96. Palustrine Emergent Wetland (Persistent)* - Includes all tidal and non-tidal wetlands dominated by persistent emergent vascular plants, emergent mosses or lichens, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Plants generally remain standing until the next growing season.

97. Estuarine Emergent Wetland* - Includes all tidal wetlands dominated by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens) and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent and that are present for most of the growing season in most years. Perennial plants usually dominate these wetlands.

98. Palustrine Aquatic Bed* - The Palustrine Aquatic Bed class includes tidal and nontidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is below 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, detached floating mats, and rooted vascular plant assemblages.

99. Estuarine Aquatic Bed* - Includes tidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, kelp beds, and rooted vascular plant assemblages.

* Coastal NLCD class only

Appendix B. Rapid Vegetation Measurements (Forests).

Used by the University of Minnesota Natural Resources Research Institute for bird point counts in forested landscapes. The objective of this vegetation sampling method is to get information on habitat structure and plant composition as quickly and as accurately as possible while conducting a bird survey. With some experience and familiarity with the trees and shrubs of the region, vegetation data can be gathered in less than 3 minutes either before or after the bird survey. A Microsoft Access database is available for entering the data. The following information is recorded:

- 1. Canopy Height** – The average canopy height (in meters) within the **100 m** radius should be estimated. This does not include shrub or subcanopy layers. Note: If the point is in a new clearcut with residual trees, estimate canopy height for the residual trees. If the point is in a regenerating aspen stand with DBH greater than 2.5 cm, estimate the canopy height of the regenerating aspen. If the regenerating aspen is less than 2.5 cm DBH, estimate the canopy height of the residual trees. Be sure to include code 9, 10, or 11 under Special Features.
- 2. Tree Density** – Estimate tree density by counting all the trees (> 2.5 cm DBH) within a **10 m** radius and assigning the corresponding density code (see code sheet) by abundance.
- 3. Shrub Density** – Estimate shrub density in the same manner as above except count those woody plants with a DBH of 2.5 cm or less within a **10 m** radius.
- 4. High Canopy Cover** – Estimate the percent coverage of the high canopy layer within the **100 m** radius, using percent estimated in increments of 10.
- 5. High Canopy % Deciduous** – Estimate the percent of deciduous species found within the high canopy, using percent estimated in increments of 10.
- 6. Subcanopy Cover** – Estimate the percent coverage of the subcanopy layer within the **100 m** radius, using percent estimated in increments of 10.
- 7. Subcanopy % Deciduous** – Estimate the percent of deciduous species found within the subcanopy, using percent estimated in increments of 10.
- 8. Understory Cover** – Estimate the percent coverage of the understory layer within the **100 m** radius, using percent estimated in increments of 10.
- 9. Understory % Deciduous** – Estimate the percent of deciduous species found within the understory, using percent estimated in increments of 10.
- 10. Ground Cover** - Estimate the percent coverage of the ground layer within the **100 m** radius, using percent estimated in increments of 10.
- 11. Tree Species** – List up to five tree species (> 2.5 cm DBH), beginning with the most abundant species.
- 12. Shrub Species** – List up to five shrub species (< 2.5 cm DBH; this can include tree species), beginning with the most abundant species.
- 13. Special Features** – List up to three special features (see code sheet). Note: Special feature 9, 10, or 11 should be used when residual trees are found within the **100 m** radius.

Rapid Vegetation Measurements (Forests) Field Data Sheet

Tree Density (> 2.5 cm DBH)	Shrub Density (< 2.5 cm DBH)	Special Features	
1 None	1 <10 in 10m radius	1 Beaver flooding	7 Natural opening in site
2 <5 in 10m radius	2 11 to 100	2 Large downed logs	8 Rock outcrop
3 6 to 20	3 101 to 500	3 Small openings	9 Residual hardwood trees
4 21 to 40	4 501 to 1000	4 Snags	10 Residual conifer trees
5 >40	5 >1000	5 Wetland pocket in site	11 Residual patches
		6 Woodland pond in site	12 Roads, buildings

Vegetation Structure		COMMENTS
Canopy height (m)		
Tree Density (1 = few to 5 = dense) - 10 m radius		
Shrub Density (1 = few to 5 = dense) - 10 m radius		
High canopy cover (%)		
High canopy % deciduous (0% = all conifer)		
Subcanopy cover (lower layer of trees: %)		
Subcanopy % deciduous (0% = all conifer)		
Understory cover (3 ft to 12 ft: %)		
Understory % deciduous (0% = all conifer)		
Ground cover (3 ft to ground: %)		
Tree species (up to 5)		
Shrub species (up to 5)		
Special features (codes)		

Appendix C. USFWS Region 5 Landbird Survey Point Habitat Classification.
(Version 2 – September 26, 2006 – Susan Talbott Guiteras)

This protocol was designed by the FWS Region 5 Regional Biologists for purposes of monitoring vegetation in association with bird point counts on refuges.

Directions for using the Data Sheet and NVCS Keys:

- 1. Data Sheet Top Portion – Record the Survey Point, Refuge, Date, and Observer.** The Survey Point name should be identical to that which is used in the Census database for recording bird survey data. (Note: You can pre-enter some information on the data sheet prior to printing.)
- 2. Locate the survey point and estimate a 50-meter radius circle around the point.**
- 3. Percent Cover** - Beginning with the most dominant vegetation community (e.g., forest stand, grassland, marsh), estimate the % of the 50-m radius covered by that community to the nearest 10%.
- 4. NVCS Classification** - Use the NVCS key(s) to identify the appropriate NVCS Association and corresponding code and enter it in the space provided (“NVCS Code”). For quick reference, also enter the simple common-name description in the space provided (“NVCS Description”). For additional guidance on using the NVCS keys, refer to the instructions at the beginning of each key.
- 5. Dominant 1-3 Communities** – If there are multiple habitat types in the 50 meters around the survey point, repeat this procedure for the next most dominant vegetation community, and so on. As much as possible, vegetation cover, plus Bare Ground and Open Water, should total to 100% cover! While it is likely that some bare or open water components may essentially occur within an NVCS type, adherence to a 100% maximum maintains consistency of data across all points. For example, if a large bare opening is situated within an otherwise forested plot, the totals might be 75% NVCS forest type and 25% Bare/Open, with Forest Opening selected. Include communities if they represent >10% of the plot, but only identify the most dominant 1-3 vegetation communities. Only in situations where several minor habitats are present (beyond the 3 dominant types) would the total cover not reach 100%.
- 6. Use of non-NVCS codes** – For anthropogenic vegetation communities (e.g., active agricultural fields, hedgerows), the NVCS does not apply. In some situations, there is no NVCS classification that fits a seemingly natural habitat. If appropriate, the habitat should be described for inclusion in NVCS, using the form provided by Nature Serve. Meanwhile, codes based on Anderson (1976) have been compiled for use in such situations. Include additional description details in Comments.

CODE	DESCRIPTION (for Landbird Point Habitat assessment)
110	Residential
141	Major highway

170	Other Urban Built-up, including mowed/maintained lawns (not managed for habitat)
180	Park-like areas, trees among buildings, landscaping other than maintained lawns
213	Inactive Cropland (<5% brush); Also for any area described simply as "mowed field" even if previous agriculture use is not indicated
400	Unknown forest/woodland not otherwise classified with NVCS
410	Deciduous forest/woodland not otherwise classified with NVCS
420	Coniferous forest/woodland not otherwise classified with NVCS
430	Mixed Decid/Conif forest/woodland not otherwise classified with NVCS
441	Old Field (5-25% brush);
442	Deciduous Brush (>25% brush)
443	Coniferous Brush (>25% brush)
444	Mixed deciduous/coniferous Brush (>25% brush)
600	Unknown wetland not otherwise classified with NVCS
611	Salt marsh not otherwise classified with NVCS
612	Tidal freshwater marsh not otherwise classified with NVCS
621	Deciduous wooded wetland not otherwise classified with NVCS
622	Coniferous wooded wetland not otherwise classified with NVCS
623	Shrub/Brush dominated wetland not otherwise classified with NVCS
624	Non-tidal herbaceous wetland not otherwise classified with NVCS
625	Mixed deciduous/coniferous wooded wetland not otherwise classified NVCS
741	Waste disposal area (landfill), even if not active

In a few instances, habitat/land cover types are recurring on refuges, but do not fit well into any NVCS or Anderson-based classification. The following additional codes have been created for such situations. Additional details (such as dominant species) should be recorded in Comments:

CODE	DESCRIPTION	COMMENTS
299	Planted WSG	Planted warm season grass fields that are not otherwise classified by NVCS
499	Hedgerow	Narrow hedgerows dominated by mature trees and/or shrubs, but clearly not representing a forested habitat, can be recorded as this.
699	Impoundment waters	Managed impoundments may be classified by NVCS in some situations, though this may be difficult if water is high and no vegetation is present
999	Unknown	No NVCS or provided Anderson-based code is appropriate; If necessary, complete the form requested by Nature Serve to describe new habitats.

(The section on non-NVCS codes was added in September 2006, based on experience of the first two years).

NOTE: Unfortunately, the keys will not always work for a specific vegetation community, or may not always seem like a “perfect match.” There are different possible scenarios:

- 1) If the key does not give you a satisfactory classification, be sure you are working with the right key. Also, try to re-trace your choices and review other possibilities at each step. At

times, it may not always be obvious which choice is the most appropriate, and you may wish to try both options and see if you get a different and better result.

- 2) If the key leads you to an Association classification that seems appropriate, but there are species in the area that are not represented in the full description for that Association, use that Code but note significant differences in the Comments section.
 - 3) Check the list of “Edge of Range Vegetation” and/or try the key for a neighboring ecoregion if you are located close to the ecoregion boundary.
 - 4) If the vegetation community does not fit any Association in the keys to your satisfaction, you may use the Appendix Field Form provided by NatureServe to describe it as a new Association. On the data sheet, note that this was done, and give the community a reference code that corresponds to the completed Appendix Field Form.
 - 5) Remember that “Altered” vegetation type descriptions may not always fit as well or consistently as natural vegetation types. “Altered Vegetation” keys have been developed for some of the Ecoregions. Do the best you can in these habitats.
7. If **Bare or Open Ground** is present within the 50-meter radius, estimate the % and note the type. This allows us to quantify the presence of features such as bare soil or sand and forest openings.
8. If **Open Water** is present, estimate the % and note the type/source.
9. **For Forested Habitats** – If you encountered a forested habitat, provide the following additional information. (Most likely, you will not have more than one forested habitat classification within 50 meters of the survey point, but may need to use space on the back or an additional datasheet if so)
10. **Average % Canopy Closure** - Estimate over the entire area and choose the best category
11. **Stand Age/Structure**: Examine representative trees in the dominant class/overstory. Circle the most appropriate category based on their size (diameter at breast height in inches).
12. **Understory Structure** – Note qualitatively the density of small trees/shrubs (0.75" - 4" dbh) as either absent, sparse, moderate, or dense. As a general rule, choose “sparse” if cover is 1-25%, “moderate” if cover is 25-75%, and “dense if cover is >75%. Repeat this procedure for groundcover (herbaceous plants and ferns).
13. **Human Structures** – Note the presences of any roads, trails, parking lots, buildings or other human structures within the 50-meter radius circle. Note that for roads, you will need to circle two categories – one to indicate if it is a Public or Service-only road, and one to indicate the road type.
14. **Invasive Species Present** – This is useful if you are not participating in invasive species mapping. Note any invasive species within the sample area. It is not necessary to conduct an exhaustive search, simply to record any species observed, and particularly those of management concern.

15. UTM – If you have already provided coordinate information in the Census database or in the online landbird point count database, this section is not necessary. If not, enter the X UTM, Y UTM, Datum, and UTM Zone in this section.

16. Optional Information. This section can be modified to suit refuge-specific data collection needs.

16.1. Recent or Typical Management Actions/Regime for Survey Site – Note if the survey area has been recently subjected to management activities (such as fire) and/or if it is typically subjected to management (such as regular mowing).

16.2. % of 50m sample radius that is currently owned by the USFWS – This may be useful information to record if the survey point is located near the refuge boundary.

16.3. Agricultural Habitat – Planted Crop – Although this can change annually, you can record the crop planted/present when the habitat assessment was conducted.

17. References

Anderson, J.R., E. E. Hardy, J. T. Roach, and R. E. Witmer. A Land Use And Land Cover Classification System For Use With Remote Sensor Data. USGS Professional Paper 964.

New Jersey Department of Environmental Protection (NJDEP). 1998. Land Use Land Cover Classification System. Accessed in 2004 and again in October 2006 at <http://www.state.nj.us/dep/gis/digidownload/metadata/lulc95/anderson.html>

18. Data Sheet (see below)

USFWS Region 5 Landbird Survey Point Habitat Classification Field Data Sheet

Survey Point _____

Refuge _____ Date _____ Observer _____

Enter the NVCS Identifier Code and Estimate the % Cover of the most dominant vegetation types within a 50-meter radius around the survey point. As much as possible, vegetation cover, bare ground, and open water should total to 100%. However, try to limit the classification to 1-3 vegetation types (If minor types beyond 3 are present, total may be <100%):

NVCS Code _____ **NVCS Description** _____

_____ **% Comments** _____

NVCS Code _____ **NVCS Description** _____

_____ **% Comments** _____

NVCS Code _____ **NVCS Description** _____

_____ **% Comments** _____

_____ **% Bare/Open** (Circle): *Bare Soil* *Forest Opening* *Unvegetated Sand/Rock* *Road/Parking* *Trail*

_____ **% Open Water** (Circle): *Ocean/Bay* *River* *Impoundment* *Pond* *Tidal Pond* *Tidal Ditch*

Forested Habitats (Complete if you encountered a forested classification in the above NVCS Codes):

Average % Canopy Closure (circle one): 0-10% 11-40% 41-70% 71-100%

Forested Stand Structure/Age (dbh in inches) (circle one):

Initiation/Seedling (<1") *Scrub/Shrub stage (1-3")* *Sapling (3-5")* *Pole (5-9")*

Sawtimber (9-14") *Mature (14-20")* *Overmature (>20")*

Understory Structure: Shrubs/Small Trees (0.75" - 4" dbh): *absent* *sparse* *moderate* *dense*

Ground cover (herbs, ferns, etc.): *absent* *sparse* *moderate* *dense*

Human structures affecting sample area (circle one or more):

None *Public Road* *Service-Only Road* *Paved Road* *Gravel Road* *Dirt Road*

Parking Lot *Foot Trail (no vehicles ever)* *Refuge Buildings* *Other:* _____

Invasive Species Present _____

(**ONLY IF** not previously collected): X UTM _____ Y UTM _____

Datum _____ Zone _____

OPTIONAL:

Recent or Typical Management Actions/Regime for Survey Site_____

% of 50m sample radius that is currently owned by the USFWS: _____

Agricultural Habitat: Planted Crop_____

**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #7
DRAFT**

After the Field Season

Version 2.0 (April 2007)

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Revision History Log:

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.	-	-
2.0	Feb 2007	Knutson, et al.	Modified for Midwest/ NE U.S.	Some aspects (wilderness prep) don't apply to us

This Standard Operating Procedure (SOP) describes the procedures that crew members will follow after the field season has been completed, including returning field equipment, entering and proofing data, and writing reports. This SOP also describes the procedures to prepare data sheets for data entry and data archival, including compilation of field notes.

Procedures:

1. Returning Field Equipment:

- 1.1. Clean all equipment before storage.** Clean all field gear, including binoculars; re-shelve reference materials. Wash any government vehicles & boats that were used to access field sites and address any needed repairs or maintenance.
- 1.2. Sign in and return field equipment.** The crew leader(s) will sign in all gear that was issued to each crew member in the beginning of the season, assuring that issued items are returned and/or accounted for. Organize any damaged or incomplete equipment, including labels describing any problems, and distinguish between functional and dysfunctional gear for the following year.

1.3. Repair damaged equipment whenever possible. Compile a list of needed purchases or repairs and give this list to the Principal Coordinator (PC).

2. Datasheets and Data Entry:

2.1. Copy the original data sheets. Upon returning from the field, make a copy of each original field data sheet using the double-sided copy feature of copying machines. Review each copied data sheet for clarity. The copied data sheets are used for data entry; it is important that the copied data sheets are readable.

2.2. Archive the original data sheets. Organize the original field data sheets by grid and point sequence and store in the designated fireproof safe or cabinet used by the Passerine Bird Monitoring protocol.

2.3. Proofread copied data sheets. Proofread the copied datasheets, making sure that they are filled out completely. All data sheets should have been reviewed for completeness while in the field. However, some deficiencies in data may not be identified until all data sheets have been reviewed as a group.

2.4. Mark corrections on copied data sheets with red pen. Any corrected errors, or changes made by the data “proofer” (that are entered differently into the database than they appear on the data sheet) should be circled using a red fine-point permanent Sharpie[®] marker. Write notes/corrections, in red ink, in the margins or in the comments section to document the corrections, and the reason for correcting, if necessary.

2.5. Establish a new study in the USGS Bird Point Count (BPC) database (Refuges) <http://www.pwrc.usgs.gov/point/>. If you are entering data from a new monitoring plan, the PC should contact the Bird Point Count Regional Data Coordinator for assistance in establishing a new study and recording the metadata in the database. Set up your study in the database before the field season starts; data entry should begin as soon as possible after the data is collected. Rain days are good times to start data entry.

2.5.1. Each FWS Region has a BPC Data Coordinator who will issue the appropriate permissions to the Refuge Responsible Party.

2.5.2. Here is the list of regional data coordinators (<http://www.pwrc.usgs.gov/point/main/mainPage.cfm?formName=113>).

2.5.3. The Refuge Point of Contact issues permissions for data entry at the Refuge level.

2.6. A technician will enter all of the data from the data sheets into the database.

2.6.1. Only online (web-based) data entry is accepted at this time.

2.6.2. The drop-down lists will facilitate easy transfer of information from the datasheet to the database.

- 2.6.3. Points where no birds were detected should note that “no birds were detected” in the comments section to distinguish that the point *was* in fact sampled.
 - 2.6.4. Once all data from each data sheet has been entered, the technician will initial and date the “Data Entered” line in the box on the bottom of that sheet.
 - 3. Proof initial data entry.** When all data have been entered, the same person that entered the data will proof the data in the database. This includes reviewing the data forms and sorting summaries (from queries) to check for typos, errors, and blank fields. As each datasheet is proofed, date and initial the “Data Proofed” line. When data entry and initial proofing is complete, press the “Update AOU #s” button on the data form. This incorporates AOU numbers, which are linked to species codes on the “tblBirdSpecies” table.
 - 3.1. Independent proof of data entry.** After the data have been entered and proofed once (as described above) a different person will proof a subset of the data from that year. Errors and changes should be logged in the database log document file.
 - 3.2. Inform the PC that data entry for the current year is complete.** The data are then ready for analysis.
- 4. Archive photographs.**
 - 4.1.** Archive the vegetation photographs taken at each sampling point. Edit the digital images so that the Refuge, plot, point, date, and NLCD 2001 land cover classification information are affixed permanently to the photos associated with that point (bottom left corner of the photo).
 - 4.2.** Archive any additional photographs taken during the field season, linking information about Refuge, plot, point, date, and subject with each photograph.
- 5. Field Notes and Reports:**
 - 5.1. Photocopy the field notes from all crew members.** Store the copies of the field notes with the original data sheets.
 - 5.2. Compile a list of faunal species detected.** Compile a complete list of bird species detected, but not during a point count. Compile a list of fauna observed, other than birds. Use the backsides of the field datasheets, along with all field notes to compile the list. Include all birds detected at times other than survey periods.
 - 5.3. Run summary reports on the data for each station (refuge).** The BPC database has a set of reports available. Sometimes errors can be detected by examining these reports.

5.4. Once the PC is satisfied with the accuracy of the data, the data is verified as all correct in the database.

5.5. Write summary report. At the end of the season, the PC will write a summary report and file it with the original data sheets and field notes. Trip reports should include the following:

- 5.5.1. Dates of the sampling events.
- 5.5.2. The sequence and times of each point count.
- 5.5.3. Map of sampling locations (GPS coordinates).
- 5.5.4. Crew members and their responsibilities.
- 5.5.5. A list of bird and other faunal species encountered; include useful standard reports produced by the database.
- 5.5.6. Nests found (including egg/chick counts, fledging dates, etc.).
- 5.5.7. General observations of weather, bird behavior, and other animals.
- 5.5.8. Any discrepancies that might affect data integrity/consistency.
- 5.5.9. Potential hazards.
- 5.5.10. Unique or noteworthy events.
- 5.5.11. Advice for future survey crews.

**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #8
DRAFT**

Data Management

Version 2.0 (April 2007)

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Revision History Log:

Version #	Date	Author	Changes Made	Reason for Change
1.0	Oct 2004	McIntyre et al.	-	-
2.0	April 2007	Knutson, et al.	Modified for Midwest/ NE U.S.	Some aspects (wilderness prep) don't apply to us

This SOP documents the database for the bird point counts and provides instructions for data entry, data validation, and database administration. The bird point count data reside in the USGS Patuxent Bird Point Count Database (<http://www.pwrc.usgs.gov/point/index.cfm>). We recommend that the Principal Coordinator (PC) establish the study in the database before the field season begins; this only needs to be done once for a multi-year monitoring plan.

1. Database Description

1.1. The USGS Bird Point Count Database is:

- 1.1.1. a searchable repository,
- 1.1.2. a tool for managing your surveys,
- 1.1.3. a place for collaboration, e.g. Partners in Flight or regional surveys, and
- 1.1.4. the official site for National Wildlife Refuge System bird point counts.

1.2. Who can use it?

- 1.2.1. It's a public site - anyone can use it, including refuges, parks, forests, or states collecting bird point count data.

1.3. Who manages it?

- 1.3.1. The USGS Patuxent Wildlife Research Center. The database is housed on computers at Patuxent Wildlife Research Center, and was built in cooperation with the USFWS National Wildlife Refuge System and the American Bird Conservancy.

The USGS staff currently responsible for the database include Mark Wimer & Bruce Peterjohn.

1.4. Data Sources.

1.4.1. The database was built to store data from anywhere in North America. Data sources may include counts on US Fish and Wildlife Service refuges, private lands such as timber company lands, Important Bird Areas (IBAs), US Forest Service forests, Bureau of Land Management or other federal lands, state lands such as parks or wildlife management areas, etc. Anyone conducting bird point counts may manage their data using the web interface.

1.5. Users.

1.5.1. Anyone with access to the web can view and retrieve data. Users include wildlife and land managers, researchers, or bird conservation groups.

2. Getting Started

2.1. If you are a National Wildlife Refuge entering data from a new monitoring plan, the PC should contact the Bird Point Count Regional Data Coordinator. Each FWS Region has a BPC Data Coordinator who will issue the appropriate permissions to the PC (Responsible Party). Here is the list of regional data coordinators (<http://www.pwrc.usgs.gov/point/main/mainPage.cfm?formName=113>). The PC (Responsible Party) issues permissions for data entry at the Refuge level.

2.2. If you are not a Refuge and would like to store your data, you will need a username and password to establish your site. Use the 'contact us' button on the website for assistance.

2.2.1. Here are some items to have prior to contacting Patuxent:

2.2.1.1. Use the study design worksheet (SOP #1, Appendix B) to organize your information.

2.2.1.2. A field data sheet (SOP #5, Appendices) will help Patuxent verify that they have all the right data entry fields for your methods.

2.2.1.3. A description or knowledge of the point count system at your site (we use the term "Land Unit" to refer to refuges, parks, forests or other areas over which a point count program is conducted).

2.2.1.4. The name and address of the person who will be responsible for your site's data. This Responsible Party is someone who may be contacted if there are questions about the data and who has a commitment to the accuracy and the validity of data entered from your site.

3. Data Entry and Validation:

3.1. This section provides instructions for how the field data sheets are reviewed and archived, and how data are entered. Data entry and validation is also discussed in SOP #7 (After the Field Season). The crew leader will bring the original field data sheets back from the field, organized by plot and point sequence, make photocopies, and give the originals to the PC.

- 3.2. Copy the original data sheets.** As soon as possible upon returning from the field, make a copy of each original field data sheet using double-sided copying. Review each copied data sheet for clarity. The copied data sheets will be used for data entry so it is important that the copied data sheets are readable.
- 3.3. Archive the original data sheets.** Organize the original field data sheets by plot and point sequence and store in the designated fireproof safe or cabinet.
- 3.4. Proofread the copied data sheets.** Proofread the copied datasheets, making sure that they have been filled out completely. All data sheets should have been reviewed for completeness while in the field. However, some deficiencies in data recording may not be identified until all data sheets have been reviewed as a group and some errors are inevitable.
- 3.5. Mark corrections on copied data sheets with red pen.** Any corrected errors, or changes made by the data “proofer” (that are entered differently into the database than they appear on the data sheet) should be circled and corrected using a red fine-point Sharpie marker. Notes, in red ink, should be written on the margins or in the comments section whenever necessary to document the reason for the corrections.
- 3.6. Enter the data into the USGS Bird Point Count Database**
 - 3.6.1. Log on to the website and use your userid and password to access the appropriate data entry web page.
 - 3.6.2. All information that is included on a data sheet should be included in the database. If you have collected optional vegetation data, these data will be entered into a separate Microsoft Access Database designed for this purpose.
 - 3.6.3. After all data from each data sheet have been entered, the data entry person will initial and date the “Data Entered” line in the box on the bottom of that sheet.
- 3.7. Proof Data Entry.** When all data for a given data entry bout have been entered, the same person that entered the data will proof the data in the database, reviewing the data forms and sorting summaries (from queries) to check for typos, errors, and blank fields. As each datasheet is proofed, date and initial the “Data Proofed” line.
- 3.8. Verification/Validation.**
 - 3.8.1. The Data Entry Technician will notify the Responsible Party or Data Manager that their data is ready to be verified in the database.
 - 3.8.2. The Responsible Party or Data Manager will then ensure all datasheets have been initialed on the “Data Proofed” line.
 - 3.8.3. Next, the Responsible Party or Data Manager will compare all data sheets with the actual data records in the database. If there are no errors, check the “Verify all as Correct” section at the bottom of the Verify Entry page for each record.
 - 3.8.4. Discuss any questionable data entry or field observer errors with the Data Entry Technician and/or Field Observer.
 - 3.8.5. After all errors are satisfactorily resolved in the database, verify the record as correct.

3.9. Download data from the website. Download all the data from that year to files at the Refuge and archive the CD with the data sheets.

3.10. Inform the PC that data entry for the current year is complete. The data are ready for analysis.

4. Database Administration

4.1. This section of the SOP addresses administration of all data and electronic files relating to the Passerine Bird Monitoring Protocol.

4.2. Data Maintenance, Archiving & Storage.

- 4.2.1. The USGS is responsible for performing periodic backups of all data residing in the master database.
- 4.2.2. Each year, after all data for the survey year has been verified, the Responsible Party or Data Manager will download all of their data residing in the master database and store as an archived copy. This archived copy must be stored at the field station and another duplicate copy should be sent to the Regional Refuge Biologist. No edits will ever be made to the archived datasets.
- 4.2.3. Editing of data that has already been “verified” in the database must be made in the master database by the Responsible Party or Data Manager via the Point Count Database web page interface.
- 4.2.4. Alternatively, if major edits are needed, the Responsible Party may contact the Data Administrator to perform the edits.
- 4.2.5. A detailed log identifying any changes to records already verified as correct and dates of the change must be maintained by the Responsible Party and stored along with the archived datasets.

**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #9
DRAFT**

Data Analysis

Version 2.0 (June 2007)

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1.0	Oct 2004	McIntyre et al.		
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This SOP will provide instructions and guidelines for analyzing bird data collected using bird point counts in the Great Lakes Monitoring Network (GLKN) and National Wildlife Refuges. Different parks or refuges have different and often multiple objectives, including describing the composition and distribution of bird communities, calculating population trends, and developing bird-habitat relationships. A wide variety of appropriate statistical methods can be used to meet these objectives, often with no clear guidance about which method is best. Here, we discuss some of the alternatives and provide some guidance, although the analytical method ultimately chosen to meet a particular objective will depend upon the particular details of each monitoring program or the expertise of the analyst. While some analyses may be accomplished by park or refuge staff with little formal statistical training, other more complex analyses, e.g. habitat associations or population trend modeling, may require the assistance of a professional ecological statistician. Thus, we provide some recommendations about what analyses should be undertaken annually and which analyses should be subject to more periodic evaluations (e.g. every 3 years).

Data Analysis
Overview

Perhaps more has been written in the scientific literature about the collection and analysis of bird point count data than about survey methods for any other biological taxon (Sauer and Droege, 1990; Ralph et al, 1995; Nav et al, 1999). Several issues related to point counts should be explicitly considered during the analysis and will be briefly reviewed here.

Sources of variability

In addition to true variability in bird abundance in space or time, there are many additional factors that can directly influence the number of birds observed during a point count survey. These factors include wind, rain, time of day, observer differences, and spatial heterogeneity, among other things. While the 10-minute, unlimited radius point count protocol has features built-in to minimize many of these sources of variability, their potential influence should be incorporated into the analysis and periodically be investigated explicitly. Of particular importance may be variability associated with different observers (Ramsey and Scott, 1981). There are well-developed statistical methods for accounting for observer variability when observers complete surveys in more than one year (Sauer et al., 1994), however, dealing with observer variability is more difficult when observers survey in only one year (Thompson et al., 1998).

The index assumption

The ultimate objective of a population monitoring program is to make conclusions about the magnitude and direction of change in true population size through time. Point counting is a method for surveying rather than completely enumerating all birds in an area (i.e. censusing), thus, the raw number of observations recorded during a point count is not a measure of density. For trend analysis, if the raw counts of birds are a constant proportion of true population size, it may be possible to use unadjusted counts as an index of the population. However, if the chance of observing a bird is not constant through time or between habitats -- that is, if there is heterogeneity in the detection probability -- then the raw counts will not be an unbiased index of population size.

There is currently a disagreement in the scientific literature about the degree to which detection heterogeneity influences conclusions about trends, with some authors being adamantly opposed to the use of unadjusted counts for any conclusions and other authors being unconvinced that accounting for detection heterogeneity improves the estimate of trend. While it may be some time before there is scientific consensus on this issue, there currently exist several alternative methods for evaluating and incorporating detection probabilities into the analysis. The point count protocol described in detail in SOP 5 Conducting the Point Count will allow analysis of detection probabilities using both distance-based approaches (Buckland et al., 1993) and time-removal methods (Farnsworth et al., 2002). At this time, we recommend periodic evaluation of detection probabilities using both distance and time-removal approaches to evaluate detection probabilities.

Efficacy of the sampling design

The conclusions that can be made from a statistical analysis are ultimately influenced by the methods used to collect the data. A common objective of using multiple survey

stations is to combine the information from the locations into a regional or pooled estimate of population size or trend. Whether the pooled trend is representative of the intended area of inference will depend on how the survey sites were selected. If the goal is to make an inference about bird populations for an entire national park or refuge, then all areas within a park or refuge must have had a non-zero chance of being included in the sample (i.e. a probabilistic design). Alternatively, the sample might have been randomly drawn from a subset of areas within a park, for example all areas within specified buffer distance from roads or trails. In this case, the area of inference would be the portion of the park near roads and not the entire park. In some existing monitoring programs, sites may not have been selected following strict adherence to a probabilistic sampling design and qualifying statements should accompany the statistical analysis. Regardless of the design used, it will be critical to understand how sites were selected and the intended population for correct statistical inference.

Statistical power, the ability of the design to conclude that a trend is occurring when in fact it is, is also influenced by the sampling design. The number of points, the duration of points, the number of revisits, the plot radius, etc...are all features of a sampling design that may influence the ability to detect trends even if an appropriate site-selection technique is used to obtain a representative sample of sites. Statistical power should be periodically evaluated through simulation and retrospective power analysis to evaluate the adequacy of the design and possibly suggest design modifications.

Analyses

Breeding bird composition

At the end of each field season, bird community composition and distribution for each park or refuge should be summarized using a variety of tables and graphs, potentially including:

- a table of all species observed with total number of observations
- a table of observed counts of individuals aggregated into life history guilds
- graphs of total abundance (corrected for effort) and occupancy (proportion of sites) vs. year for each species and life history guild
- species accumulation curves per station, per stratum (if applicable), and per park or refuge
- reports of rare species or unusual occurrences, potentially forwarded to state natural heritage programs
- maps of the spatial distribution of species in the park or refuge
- descriptive statistics that report the accomplishments of the field season: number of points surveyed, number of species observed, number of participants, etc...
- descriptive statistics that report the number of individuals observed by time interval and by distance interval
- if vegetation data are collected, etc....

Population trend and habitat analyses

More complex analyses of trend and habitat associations should be carried out periodically (e.g. every 3 years) using appropriate statistical methods.

There is a well-developed literature on trend analysis of bird data to draw upon when deciding on the analytical approach (Ralph et al., 1995; Nav et al., 1999). Thomas (1996) summarized the wide variety of statistical approaches for evaluating bird population trends, which generally boil down to regression approaches that model population size (or an index) versus time. Differences arise in how the methods incorporate covariables, the assumed distribution of residuals, variance estimation technique, and weighting approaches. More recently, McKenzie et al. (2002) described a technique for evaluating trends in site occupancy rather than population size. A major current emphasis is being placed on developing statistical tools for incorporating detection probabilities into trend analysis (Buckland et al., 1993; Farnsworth et al., 2002; Thompson et al., 2002; Bart et al., 2004). Regardless of the trend analysis method that is chosen, there will be three critical issues to address: 1) how to integrate the information from multiple survey stations into a park- or refuge-wide estimate of trend, 2) how to account for sources of variability, and 3) how to deal with heterogeneity in detection probability.

There is also a long history of analytical approaches to develop relationships between bird abundance or occupancy and habitat characteristics (Morrison, 1992; Scott et al., 2002). Usually, habitat is characterized by measurements of vegetation or land use. Regression techniques (e.g. linear, logistic, Poisson) are the most common traditional technique for developing habitat relationships (Morrison et al., 1992), but other accepted methods include indicator value analysis (Dufrene and Legendre, 1997), classification and regression trees (De'ath and Fabricius, 2000), and ordination techniques (McCune and Grace, 2002). Habitat analyses may use predictors summarized on varying spatial scales, for example micro-scale vegetation measurements or land-use in larger spatial buffers. Periodic assessments of bird population change in relation to changes in vegetation structure and composition will provide insight into the relationships among ecosystem components, and improve our understanding of breeding bird-habitat relationships and the effects of large scale perturbations.

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**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #10
DRAFT**

Reporting

Version 2.0 (June 2007)

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Revision History Log:

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2.0	June 2007	Danz et al.	Updated	

Overview: This SOP addresses reporting on data analysis of bird point counts collected in the Great Lakes Network and National Wildlife Refuges (NWRS). The National Park Service Great Lakes Network (GLN) has guidelines and schedules for reporting monitoring data via reports, journal papers, and meetings and symposia. At this time, the NWRS does not have formal guidance for reporting passerine monitoring. However, the guidelines provided here are reasonable and can be applied by National Wildlife Refuges as well as Parks. The network reporting strategy identifies the following reports:

1. Annual Reports
2. Analysis and Synthesis Reports – Trends and Habitat Relationships
3. Protocol Review Reports
4. Scientific journal articles and book chapters
5. Symposia, Meetings, and Workshops

1. Annual Reports

Overview: The GLN reporting strategy requires Annual Reports for each Vital Sign. Field sampling runs from May-July each season, with data analysis and report writing to

be accomplished prior to the start of the subsequent field season, by April of the following year. Purposes of the Annual Reports are to:

- Archive annual data and document monitoring activities for the year
- Describe the current condition of the resource and provide alerts if data are outside bounds of known variation
- Document changes in monitoring protocols
- Promote communication within the park or network

Prerequisites: This SOP for producing the Annual Report begins where the SOP for Data Analysis left off. The Data Analysis SOP produces various tables and graphics to summarize patterns in bird community composition and distribution as well as various details about the field season. Summary tables and graphs created in other software formats must be imported into the (Microsoft Word) Annual Report for the Passerine Bird Vital Sign Protocol.

Instructions:

The Project Leader will write an Annual Report on the GLN Passerine Bird Vital Sign for submittal to the Network Coordinator in March/April of every year, according to specific deadlines set by the Network Coordinator. The report will summarize details about the prior field season and describe patterns of bird composition, distribution, and change evaluated during data analysis.

Refuges will be entering their data into the USGS Patuxent Bird Point Count Database (<http://www.pwrc.usgs.gov/point/index.cfm>; SOP # 8). The Responsible Party at the refuge can generate and download reports summarizing species lists and species ranked by abundance for various subsets of the data (entire refuge, habitat type, or management unit).

2. Analysis and Synthesis Reports – Trends and Habitat Relationships

Overview: The GLN reporting strategy requires periodic Analysis and Synthesis reports for each Vital Sign. Purposes of the Analysis and Synthesis reports are to:

- Evaluate patterns/trends in condition of resources being monitored
- Discover new characteristics of resources and correlations among resources being monitored
- Analyze data to determine amount of change that can be detected by this type and level of sampling
- Context – interpret data for the park within a multi-park, regional or national context
- Recommend changes to management of resources (feedback for adaptive management)

Instructions:

In preparing the Annual Work Plan for Passerine Bird Monitoring, the Project Leader will plan and budget for preparation of an Analysis and Synthesis report, at least every 3 years.

Analysis and Synthesis reports will include documentation of statistical methods, results, and discussion of population trend analysis and/or bird-habitat relationships resulting from data analysis described in SOP 9.

3. Protocol Review Reports

Overview: The GLN reporting strategy requires periodic Protocol Review reports for each Vital Sign. The anticipated schedule is that review would be held at about 5 year intervals. Purposes of the Protocol Review reports are to:

- Periodic formal reviews of operations and results;
- Review protocol design and products to determine if changes needed;
- Part of quality assurance – peer review process;

Instructions:

Working with the Network Coordinator, the Project Leader will plan and budget for a Protocol Review Workshop and report about every 5 years, beginning 5 years after the initial protocol is approved and after completion of the first Analysis and Synthesis Report on Trends.

The Project Leader will follow the Network SOP# 11 on Revising Protocols in incorporating any changes recommended by the protocol review process.

4. Scientific Journal Articles and Book Chapters

Overview: The GLN reporting strategy encourages periodic publication of monitoring program results in scientific journal articles and book chapters. Purposes of these peer-reviewed publications are to:

- Document and communicate advances in knowledge;
- Part of quality assurance – peer review process;

Instructions:

In preparing the Annual Work Plan for Passerine Bird Monitoring, the Project Leader will plan and budget for writing of manuscripts suitable for submission to peer-reviewed scientific publications, as findings warrant.

5. Other Symposia, Meetings and Workshops

Overview: The GLN reporting strategy requires participation in symposia, meetings and workshops, at regular intervals. Purposes of participation in these activities are to:

- Review and summarize information on a specific topic or subject area;
- Communicate latest findings with peers;
- Help identify emerging issues and generate new ideas.

**Passerine Monitoring Protocol for
National Wildlife Refuges (Midwest and Northeast) and
National Parks of the Great Lakes Network**

**Standard Operating Procedure (SOP) #11
DRAFT**

Revising the Protocol

Version 2.0 (April 2007)

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1.0	Oct 2004	McIntyre et al.		
2.0	June 2007	Knutson, et al.	Updated	

The June 2007 version of the protocol is a ‘beta’ version suitable for testing by Refuge and Park staff. We are seeking stations that are willing to pilot test the protocol in 2007 and provide feedback to help us improve it. At the same time, we will be seeking formal reviews of the written protocol and general comments from a larger set of interested persons. All comments are due by July 27, 2007.

1. Plan for Finalizing the Protocol

1.1. We will work with other agencies and bird conservation groups in the Midwest and Northeastern U.S. to promote standardizing routine passerine bird community monitoring and data management so that unified analyses across multiple states, federal Regions, etc. are possible. We believe that agreement upon routine monitoring of most passerines for general purposes (biological inventories, habitat management, and trend analyses) will free up resources to focus on the special monitoring needs of rare and declining species or those that are difficult to detect.

1.2. We plan to revise the protocol during fall of 2007; it will then become the standard protocol for monitoring passerines in National Wildlife Refuges in the Midwest and Northeastern Regions and in National Parks of the Great Lakes

Network. It will be used for routine passerine monitoring purposes when specialized monitoring is not warranted. The FWS Regional Refuge Biologist or the NPS Network Coordinator will advise stations when specialized monitoring is warranted.

2. Comparisons Between New And Historic Bird Data

2.1. The raw data collected with this protocol can be compared with Breeding Bird Survey data (3 min.) and with previous passerine data collected by Refuges, Parks, and state agencies in the Midwest and Northeast through summaries of wider distance bands and alternative time periods (3/2/5=10 min. or 3/2=5 min.). This protocol uses additional distance bands compared with previous protocols used in FWS Regions 3 and 5 (Pence 1996; Howe et al. 1997) and divides the listening time into 10, 1-minute intervals. In addition, the protocol allows the estimation of detection probabilities using both distance estimation and the removal method (Farnsworth et al. 2005), something previous protocols did not entirely accommodate.

3. Future Revisions

3.1. We expect to revise the protocol as needed when new research prompts the ornithological community to change the preferred methods for monitoring passerine birds. Changes in the protocol will be documented in the Revision History Log and in the metadata of the USGS Patuxent Bird Point Count Database (<http://www.pwrc.usgs.gov/point/index.cfm>). Possible effects on comparisons between historic and future data will be considered at that time. A review of the protocol will be scheduled at least every five years by the Regional Refuge Biologist and Great Lakes Network Coordinator, if changes are not warranted before that time.

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