3/9/92

MANAGING AND MONITORING BIRDS USING POINT COUNTS:

STANDARDS AND APPLICATIONS

Introduction

by C. John Ralph, Sam Droege, John R. Sauer
and the Members of the Point Count Workshop[1]

Birds are salient features of North American environments. Their continuous song during the summer, their bright plumages, and their visibility attract even the urbanites' attention and inspires many to pursue their study. Despite their visibility, counting birds can be a frustrating business: territorial behavior keeps populations uniformly, but thinly, distributed; dense vegetation can hamper visibility; and a myriad of songs and calls are challenging to learn.

Many factors can reduce an observer's ability to count birds. These factors can often overwhelm the very aspects of bird populations that were meant to be measured (Ralph and Scott 1981, Verner 1985). Many types of counting techniques are available to estimate relative abundance and population trends. Among them, modifications of the unlimited distance point counts (Blondel et al. 1981) often represent the best compromise between economy of collection effort and precision and accuracy of the estimates of population trends or population indexes (Verner 1985).

This document presents a set of suggested standards for managers and researchers who would like to use point counts during the breeding season to track population trends or determine associations between birds and their habitats.

Need for Standards

Many new bird monitoring programs are currently under development, and most are on a local or regional scale. Many different protocols have been developed, tailored for individual goals and logistical constraints. These local programs have the potential to provide a wealth of data, both on local aspects of regional trends, and on comparisons of bird-habitat studies. To permit comparisons among projects, standardization of effort is warranted. In the case of comparing estimated population trends among surveyed localities, techniques of sufficient statistical rigor are required, but rigid adherence to one set of standards is not. However, uniformity of

----

1

The people who contributed to these standards by comments are: William Buskirk, Andre Cyr, Deanna K. Dawson, D. Fillman, J. Edward Gates, Gary A. Griffith, JoAnn M. Hanowski, Robert Howe, Richard L. Hutto, Douglas H. Johnson, Ed Johnson, Gerald J. Niemi, G.W. Pendleton, S. Orsillo, Jesse L. Overcash, Daniel R. Petit, Lisa J. Petit, Bruce Peterjohn, Carol Pearson Ralph, C.S. Robbins, Jean-Pierre Savard, Dave Smith, Frank R. Thompson, Jerry Verner, and Dan Welsh.

technique is usually required when comparisons are made among programs measuring habitat use.

Since integration of these projects is highly desirable, consistency among programs is essential for several reasons. The standard survey methodology for these programs is point counts. In these, birds are counted at a preselected point for a specified period of time. Because these counts are greatly affected by many factors, any comparison of the counts is strictly dependent on controlling the time spent counting, time of day, seasonal effects, observer differences, and other factors that influence probability of detecting birds at a point.

In general, bird surveys fall into two major, but not necessarily independent, categories: surveys designed to estimate trends, and those to evaluate bird-habitat associations. For trends, we want unbiased samples, consistent detection probabilities over time within species, and sufficient sample size. For bird-habitat associations, we want unbiased samples within habitats, consistent detection probabilities among habitats, and sufficient samples within habitats. The standards presented below reflect a compromise between these goals.

Background for Standards

The following standards for point counts were developed at a workshop held in Maryland, November 6-7, 1991. Many of the biologists attending[2] gave papers on point count methodology. The purpose of this workshop was to develop the components of point count methodology sufficient to: (1) provide trend data for monitoring population changes; and (2) predict population responses to habitat manipulations. Each of the 25 papers given at the workshop addressed specific aspects of the methodology.

This document is a product of this workshop, and the guidelines presented here provide the means to develop local, regional, and national monitoring programs. The proceedings of the workshop will be published in 1992.

National, Regional, and Tropical Applications

The methodological standards identified in this document are designed to provide a sound starting point in the development of local or regional monitoring programs. They should also function as a means of standardizing the collection of avian data which will facilitate comparisons among projects. The standards identified in this document should permit any manager to develop an appropriate monitoring or research program.

Data generated from these programs will have a number of valuable uses beyond local assessments. Population trends from National Parks and other

----

2

Participants in the workshop were: Richard Barter, William Buskirk, Greg Butcher, Andre Cyr, Deanne Dawson, Barbara Dowell, Sam Droege, Naomi Edelson, Don Fillman, Edward Gates, Leslie Gerstenfeld, James Gibbs, Gary Griffith, Joann Hanowski, Robert Howe, Richard Hutto, Douglas Johnson, Ed Johnson, William Kendall, James Lynch, William McShaw, Scott Melvin, Sandra Orsillo, Jesse Overcash, Diane Pence, Greg Pendleton, Bruce Peterjohn, Dan Petit, Lisa Petit, Jeff Price, C. John Ralph, Janet Ruth, John Sauer, David Smith, Charles Smith, Frank Thompson, Járge Vega, protected areas will permit comparisons of species in wilderness areas with populations from areas under active management. Comparisons can also be made with the more widespread assessments from the Breeding Bird Survey or Christmas Bird Counts. Population trends from lands managed by government agencies will permit agency specific evaluations of population health and status. Point count data that can be associated with habitat measures can be pooled across many programs to test hypotheses regarding bird-habitat relationships and to validate existing bird-habitat models.

Comparisons of bird-habitat relationships across different regions requires the use of standardized collection techniques. Managers who are using point counts to develop bird-habitat models should feel more constrained to use standardized techniques.

Point count methodology has applicability in seasons and circumstances beyond those we discuss. Point counts have been used in both the tropics and temperate areas to monitor wintering migrants (Hutto, Lynch, Robbins, and xxxxxxx). Point count methodology can be applied in Latin America, but may need modifications. For example, in hot weather and in the non-breeding season, detectibility declines more rapidly during the course of the day. As quickly as possible, work needs to be launched to determine the usefulness of the monitoring techniques discussed here for use during the winter, or for use in Latin America.

Many of the suggested standards presented in this document will undoubtedly require future modification as components of point count methodology are tested under new conditions and in new environments.

National Data Center

In light of the additional uses these data have to researchers and managers, it would be useful to have copies of the data sent to an accessible central repository, either a national or several regional data centers.

A crucial element in implementing a national program would be the establishment of data center(s) to help maintain uniformity of methods, provide data tabulation, interpretation, analysis, and act as a conduit for providing data to agencies and researchers for analysis.

Developing a Local Monitoring Program

As part of the goal-setting process, the purposes behind the development of a monitoring program should be stated explicitly. We suggest that the following questions be addressed:

(1) What is the intent of the monitoring?
- a. Regional trends or habitat specific monitoring?
- b. Evaluation of all species, a target group of species, or a single species?
- c. What is the expected relationship between the results of a population change and management actions?

(2) How is the monitoring to be accomplished?
- a. What will be the protocol used at each station?
- b. How will the samples be allocated?
- c. When will the survey be conducted?

(3) How do we judge if the monitoring is successful?
- a. What are the initial goals of precision?
- b. What analytical methods will be used to determine if goals are met?

Biologists can use these standards to assist in addressing these questions. ~~in developing quantifying~~

~~Once the above questions are answered, then the biologist can implement the point counts using the following recommendations.~~ Each recommendation is then followed by a justification prepared by the committee.

Recommendations and justifications

Establishing the Dispersion of Points

*** 1. Census points should be systematically located with a random starting point, either on roads or off roads.**

Location of points is a crucial component of any monitoring program, as improper spatial arrangement of points can result in biased estimates of both trend and habitat associations. If the goal is to estimate population trends for an entire management unit, then point counts should be spaced evenly throughout that unit, or along the road system in an area, without regard to current habitat configurations. Completely random samples ensure no bias, but may be impractical to locate and survey in the field. Systematic samples with a random starting point are often used in field experiments (Cochran 1977). Because systematic sampling ensures coverage throughout a study area, and samples are often limited in monitoring programs, systematic samples may be preferable to random samples for many sampling objectives (Sauer et al. in press). These samples are generally accepted as equivalent to random samples when no pattern exists in the environment. However, if sample points are not independent, because of, for instance, a pattern in the habitats, estimates from systematic samples may be biased (Sukhatme et al. 1984). Consequently, care must be taken to avoid placement of a systematic sample along known gradients in bird abundance, such as all points being placed along a riparian corridor.

Stratification of census stations

*** 2. Stratification of census stations by habitat should only occur if habitat-specific population estimates are required.**

If the goal is to estimate population trends for an entire management unit, then stratification by habitat may not be appropriate. Stratification is appropriate when the management unit can be divided into discernible parts differing in distribution or abundance of birds. Unfortunately, habitats can change quite rapidly in a managed area, and initial stratification by habitat may not be appropriate after such a change. If consistent habitats can be identified, careful consideration should be made of edges and other types not readily classified to avoid bias in a regional estimate. Elimination of these habitats from the sample is only acceptable when, for example, the sampling is designed to provide estimates for differences between major habitats in the area, but not an overall characterization.

Bird-habitat modeling

*** 3. Placement of stations for bird-habitat modeling should avoid boundaries between habitat types, if possible.**

Investigation of the relationship between bird abundance and habitat requires some means of associating bird counts with habitat types. A random or systematic sampling of bird communities across the entire landscape will cause some points to fall on or near the boundaries of several habitat types. Data gathered in this fashion can be used to determine bird species associations with habitat, and will reflect the variation in habitat conditions within a landscape. Under some circumstances, a better design would be to systematically place sampling points within the interior of habitat types.

If the station has two or more habitat types within the distance that birds are detected, birds at each point can be allocated to the different habitat types, but edge between the habitat type may confound the relationship between birds and habitat.

The underlying question is: how can samples be allocated within a certain habitat type? The easiest way of ensuring samples measure birds within a given habitat is to stratify habitats and place edges and other questionable areas into separate strata. Samples should never be allocated so that a portion of the region could not be sampled. However, locations of points can be constrained to be a certain distance away from the boundaries, as long as the radius of coverage from the points can reach the boundaries.

Road vs. off-road counts

*** 4. Observers should attempt to carry out censuses primarily on tertiary roads, then secondary roads, avoiding wide, primary roads. Off-road censuses should be carried out in major habitats not covered by road systems. These should be done on trails, if possible.**

Laying out a systematic or randomly located point count system on the ground requires substantial amounts of time. Sampling stations must be located and their positions permanently marked. Once sampling begins, a substantial amount of time must be spent walking between the stations to do the surveys. The longer it takes to get between sampling points, the fewer points an observer can census during a day or a season.

If a road system exists in the region where monitoring is planned, the option of setting up samples along roadsides should be strongly considered. Using roads, travel time can be reduced to as little as 1-2 minutes between sampling points. Under optimal road conditions, up to 40 5-minute point counts can be conducted in one morning. In an off-road situation, the number of point counts one observer can conduct during a morning varies between 3-15.

Using roads as a means of traveling between counting stations is logistically appealing. Unfortunately, roadside habitats usually do not sample all of the available habitats. In those situations a collection of both on and off-road surveys can be created that best fits local conditions.

In some cases the presence of a road modifies the surrounding habitats. However, Hutto and Hejl (this volume) have shown that in the case of tertiary road systems (i.e. narrow dirt roads), birds are counted in approximately the same proportions both on roads and off. Keller and Fuller (this volume) have shown that, along secondary roads running through forested environments in the Blue Ridge Mountains, edge species are more abundant at the road edge vs. away from the road. However, they also found that obligate forest interior species were detected at nearly the same rates along roadsides as they were in interior points. Ralph et al. (this volume) found in Alaska and California an increase in individuals along roads, but determined it was likely due to increased observability of birds along the road path. Road counts may increase detection rates by enabling the observer to miss fewer silent, flying birds. While many regions and habitat types have not been investigated, it seems reasonable to assume that measures of relative abundance taken from counts along roadsides will be different in some fashion from those in interiors. This is not to say, however, that one is preferable to the other, merely that they will be different. This is less likely to be true when secondary and tertiary roads are used. If the goal is to monitor population trends, using roadsides will greatly increase data collection efficiency, as long as there is no reason to believe that bird populations or habitats along roadsides are changing at a different rate than the rest of the landscape. An example would be when woodlands along roads are left as a buffer, while the remainder of the landscape is cleared. In the case of monitoring populations in relationship to habitat, roadside counts would be appropriate as long as the investigator also monitored the concomitant vegetation changes, as would also occur in off-road counts.

Number of sampling stations

*** 5. The number of samples necessary to meet the program objectives should be derived from the statistical evaluation of pilot data.**

Once the appropriate sampling framework has been established, the number of sampling stations needs to be determined. Because of the long-term nature of most monitoring programs, an evaluation of the number of samples necessary to meet the defined goals will help the manager assess the feasibility of meeting the stated goals before funding commitments are made.

Among the factors influencing sample size are:

1. The sampling methods.--In point counts, the average population and its variance are determined in part by how the counts are conducted. Time of sampling at a point and replication of counts both affect the allocation of samples. Barker and Sauer (MS) review some of the tradeoffs. Once the decisions are made regarding how to sample (using the guidelines here) the number of samples can be determined.
2. The parameter to be estimated.--If population trends are of interest, methods discussed in Sauer and Droege (in review) can be used. If average counts by habitat or region are of interest, standard statistical procedures can be applied (Thompson and ?, this volume). All sample size allocation procedures require some initial estimates of the parameter of interest and its variance. These initial estimates can come from either a pilot study in the area, or from existing data from a comparable study.
3. The target species.--If many species are of interest, one has to adopt a strategy to either: (a) allocate sufficient samples to accurately estimate the populations of all species; (b) select a subset of crucial species, and allocate samples only with regard to the subset; or (c) allocate samples to adequately estimate populations of a fixed percentage of the species of interest. In practice, strategy "a" is unlikely to be feasible and "c" will poorly sample important species. Therefore, option "b" may be best, requiring identification of critical species and sampling so that all species in this group are adequately estimated.

The number of stations adequate to characterize the birds of a given area, such as a watershed, or a habitat within a watershed, depends upon the number and dispersion of birds in the area and the probability of detecting birds. Only a few common species are detected at many of the stations, even in uniform habitat. In the absence of pilot data, an absolute minimum of at least 30 points should be established in a given habitat. With 30 stations or fewer, analysis will be possible for only the most common species. Sample sizes for rare or difficult to detect species may require a substantially greater number of sampling stations than 30.

Count period at each station

*** 6. Time spent at each count station should be five minutes if travel time between counting stations is less than 15 minutes and ten minutes if travel time is greater than 15 minutes.**

The amount of time spent counting birds at each sampling station is a compromise between acquiring an accurate picture of the birds present at a single point and increasing the statistical power of the effort by sampling a larger number of stations and birds. A number of researchers have investigated this relationship (Verner 1988, Barker and Sauer this volume, Ralph et al. this volume). Most studies found that at any single sampling station an observer quickly records the majority of the species and individuals within the first few minutes. The statistical efficiency, that is, the total number of new individuals per hour of field work, reaches a peak of about a 20% increase at about 3-5 minutes. The greatest efficiency, however, occurs as a result of increasing the number of stations, whereby efficiency can be more than doubled by the use of three vs. ten minute counts.

Evaluation of the data, largely from wooded and brushy habitats, lead us to propose a standard of 5 minutes. A minimum count length of 3 minutes is possible under certain circumstances for comparison with Breeding Bird Surveys, but a 5 minute count period should be the standard for counts that have travel times between stations of less than 15 minutes, and 10 minute count should be the standard for regions with travel times of greater than 15 minutes between counts. During the workshop, many felt that the minimum time could have been set at six minutes, because it conveniently separates into two, three minute (the BBS standard) segments. However, 5 minutes is the most commonly used duration in the literature, and is the European standard (Koskimies and Vaisanen 1991), thus promoting comparisons with already existing data sets.

*** 7. When a five minute point count is used, data should be separated into those individuals seen or heard during the first three minutes and those additional individuals heard in the remaining minutes. If a ten minute point count is used, data should be separated into three segments of three, two, and the final five minute period.**

This will facilitate comparisons of data collected by projects using shorter point counts.

Distance between counts

*** 8. The minimum distance between point counts is 250 m.**

*** 9. Birds previously recorded at another sampling station should not be recorded again.**

There are many reasons for having point counts as far apart as possible. The closer the distance between points, the more likely an observer will count the same bird twice. In addition, the farther apart the stations, the more likely that vegetation and other factors have changed, providing greater statistical independence between points. On the other hand, the greater the distance between sampling stations, the longer it will take to travel between those points, and the larger the area required to establish a given number of points. Fortunately, relatively few birds have voices that travel great distances, and because these are normally easy to track when moving between points, the chance of double counting is low. The choice of a standard minimum distance of 250 m between counts is based upon the fact that in most habitats, more than 99% of individuals are detected within 125 m of the observer (XXXXX, xxxxx). In open environments, this minimum distance should be increased due to the greater detectibility of birds. Along roads, where travel by vehicle is possible, distances of 500 m or more should be used.

<u>Counting radius</u>

*** 10. All individual birds detected at a point should be recorded.**

Care should be taken to tally only the minimum number of different individuals as determined by concurrent recordings, counter singing, or other individual recognition methods like plumage differences. The use of a map (see below) can help in this effort.

*** 11. Birds detected within a radius of 50 m surrounding the center of the point should be recorded separately from those at all distances.**

Species vary in their conspicuousness. These differences in detectibility make between-species comparisons of absolute abundance difficult. If point counts are used primarily to monitor population changes, counting individuals of all species seen or heard at a single station will maximize the amount of data taken. If, however, comparisons of abundance between species are important, then by assuming that: all the birds within 50 m of the observer are detectable; observers do not actively attract or repel birds; and birds do not move into or out of the count circle during the counting period; then, data collected from within a 50 m radius of the point center can be used for among-species comparisons of abundance (Verner 1985). A variety of distances have been employed by observers, with 50 m in forested environments being the most common. If the habitat is exceptionally dense, a distance of 25 m may be used, and observations should be separated into 25, 50, and greater than 50 m, to allow comparisons between studies.

Alternatively, if the distances to observed birds can be accurately estimated, it is possible to calculate the density of the more common species by estimating detection rates with variable circular plot methods (Reynolds et al. 1980). Relatively precise estimation of distances are necessary to use this technique appropriately and it is best applied using highly trained observers and bird communities with relatively few conspicuous species (Verner 1985).

If unlimited distance point counts are being used to investigate the relationship between birds and habitats, then it is very important that the points be located well within the interior of the habitat so that birds from outside habitats are not recorded.

<u>Replication of points vs. establishing additional points</u>

*** 12. It is usually better to increase the number of sampling stations, than to repeatedly count a smaller number of stations.**

Replication of counts at a single point, either during same day or on different days, will yield better estimates of species abundance and community composition of birds at that single point. In some cases there is not enough room in an area to establish additional point counts without overlapping too greatly with those already established. In this case, as in the case of increasing the number of total sampling points, replicating the point counts will increase the precision of the estimates of bird population size, albeit less efficiently than adding new ones.

In general, a station should only be sampled once each season. Counts can be repeated if the goal is good estimates of the community at certain, specific points, such as a small area of rare wetland habitat.

Under circumstances where replication is required, determining the optimal number of replicates requires the accumulation of pilot data for each species. At some number of replicates, the gain in numbers of individuals detected will be offset by the amount of additional time it takes to collect that data. Numerous papers within this volume demonstrate the application of these techniques.

Time periods for counts

*** 13. Breeding season point counts should be conducted during the time of day and time of year when the detection rate of the species being studied is most stable.**

The visibility or detectibility of a species varies with time of year and time of day (Best 1981, Robbins 1981a). At some point during the breeding season, most species exhibit a period of several weeks where detectibility is relatively stable. Unfortunately, among species, those time periods often only partially overlap. Within the breeding season, the month of June and the first week in July are best for counting most passerines in North America. However, stable counting periods are as early as May in the Southeast and Southwest, and may extend later in the boreal zones.

The rate of calling and singing also varies with the time of day. Examining pilot data is the best way to determine when detection rates are the most stable. In general, the period between official sunrise and the ensuing 3-4 hours is usually relatively stable. During the period between dawn (first light) and sunrise, the number and rate of singing in most species is somewhat higher than the rest of the morning. For maximum comparability in detection probabilities for species among points, it will be best to start counting at birds at sunrise rather than at first light.

An exception to the rule of starting counts at sunrise can be made if counts are used to calculate population trends and the order of the counts are the same in relation to the time of day. For example, if points: 1-3 are always during the first 1/2 hour before sunrise; 4-20 are always counted during the stable early morning period; and 21-30 are always during the late morning hours, then comparisons among years using these points are possible.

Appropriate weather conditions

*** 14. Birds should not be surveyed when it is raining, during heavy fog, or when noise from wind-blown vegetation interferes with counting.**

Very windy and rainy conditions almost always decrease the number of birds detected on point counts (Robbins 1981b). The degree to which these conditions affect the counts will depend upon the species and habitats surveyed. In some cases slight breezes can significantly depress the number of birds heard (E. Johnson, this volume), while in open environments, lack of trees and their associated noises permit the collection of count data under relatively heavy winds (D. Bystrak, pers. comm.). Verner (1985) has recommended that no surveys be conducted with winds greater than 11 km/hr, during precipitation, and under foggy conditions. If, when conducting a survey, an observer feels that noise from wind or rain is causing decreases in observations of greater than 10%, then data collection should end. An appropriate index to this decrease is the inability to detect birds at the longer distances as the wind or rain increases.

Number of observers at a single point

*** 15. Only one observer should be permitted to count birds at a single point.**

Even the best observers do not record all the potentially detectible species or individuals during the count period. It is easy for a bird to fly by while an observer records data or looks the other way. When many birds are calling, it is also easy to miss a bird that calls once or only faintly. Because all point counts are only partial samples, consistency of effort is critical in maintaining the comparability of counts. Additional observers at a point greatly modify the rate of detection of birds over time and therefore reduce comparability with other points with a single observer.

Observer training

*** 16. Only observers able to identify all the targeted birds by sight and sound should participate in a monitoring or research project using point counts.**

It cannot be overemphasized that the success of any bird monitoring or research project hinges on the caliber of the observers collecting the data. Given the normally high turnover in the technicians that do the bulk of data collection, comparability among observers is critical. If differences among observers are very great, they could eliminate most (if not all) of the power of a monitoring program to detect changes in bird populations (Faanes and Bystrak 1981, Kepler and Scott 1981).

The ability to identify birds by sight, and especially by sound, is a skill that usually takes several years to develop, unless an intensive training program can be undertaken. An ornithology course or several trips into the woods is inadequate preparation. Any individual who will be participating in a program to monitor birds should have comparable identification skills to that of the local experts. Training may not be difficult if only one species is being monitored, but if everything at each point is counted, then the training of raw recruits is almost certainly too time-consuming to be feasible.

We recommend that any applicant's ability to survey birds should be tested. Unfortunately, no completely valid testing procedure exists (see Janoski, this volume). However, by using known, qualified observers as a gauge, it is possible to quickly ascertain the suitability of an observer. Both the benchmark observer and the new observer need to simultaneously count birds under circumstances similar to those to be imposed by the project. Any deficiencies in the new observer's ability to identify birds will be quickly apparent.

While most projects will rely on observers already trained in the art of bird identification to do their field work, new observers will eventually be needed to replace those who depart. To help in the long-term development of a pool of observers who have the skills necessary to identify bird by sound, agencies can promote the learning of bird songs. Permitting novice bird counters to work with experienced birders is the quickest way to learn bird songs. Bird tapes will also help new observers work on their identification. We suggest that the following is adequate for training: (1) a regional vocalization tape should be available (these usually do not have complete songs and calls of all species and every effort should be made to obtain a complete one); (2) a test tape should evaluate each observer's correct identifications; (3) simultaneous censusing with an experienced observer during 3- or 5-minute road counts, with immediate feedback as to the number and directions of birds, will speed learning; and (4) all observers should have a hearing test. As a general rule of thumb, concordance of species composition between simultaneously counting observers should be near 90%, and the number of individuals should be within 80%.

Recording data

*** 17. A standard field form should be used to insure compatibility of data taken between participants in the program.**

Appendix A contains sample field sheets and Price (this volume) has outlined standard database design for recording point count information.

One of these sheets utlizes a map for recording observations. A map is an efficient way to record data, especially in counts longer than three minutes. Maps help in keeping track of locations of birds, allow accurate quality checks, and permit a variety of data to be taken. Use of single letters for the commonest 10-15 species, and the standardized behavior codes for separating birds and recording movements and simultaneous observations, will facilitate data taking.

Under many circumstances a data sheet on which the observer places "tick" marks for the birds of each species and in each category (for instance, distance), is a efficient and error-free method.

Age, sex, and behavioral classification of birds

*** 18. Juvenile birds or birds that fledged during the current breeding season should be recorded separately.**

*** 19. Birds that were detected flying over the point rather than detected from within the vegetation should be recorded separately.**

Birds detected while counting can often be identified to the age and sex of the individual. However, because birds are largely detected through the sounds they make, and because there are numerous differences among species as to which sex vocalizes, regular collection of sex data should be considered of secondary importance. By contrast, numbers of fledgling birds increase as the breeding season advances. To reduce the bias associated with seasonal increases in the numbers of fledglings, numbers of fledglings should be tracked separately.

Birds that are detected flying over the plot are less likely to be breeding or associated with the habitat surrounding the point than an individual near the ground or in vegetation. However, flyovers do live in the general area, and can be recorded.

The priority of breeding season surveys

* 20. Most effort in point count studies should occur during the breeding season.

While the focus has been on breeding season for many surveys, and should occupy the majority of effort, migration and winter habitats are vital to many species' survival. Species have been found to show habitat dependencies during this season, while they are non-specific in breeding (Manuwal and Huff 1987). Winter counts are important because many species are limited by their ability to survive the winter and many spend 8-10 months on the wintering grounds. Fixed-width transect counts and playbacks may be necessary in this season, although they greatly limit comparisons with other methods. Migration counts can be used for northern or high altitude species and to identify important stopover sites. However, migration and winter counts are difficult to interpret because of high variability, and their feasibility remains to be determined (Robbins 1972, Cyr et al, this volume).

We suggest that breeding season counts in the northern United States and Canada, counts should make up 70-80% of the effort in any area, and migration and winter counts, 10-15% each. In the southern U.S. and Latin American, 50-70% during breeding, 10-20% during migration, and 20-40% in the northern winter.

Modifications for specialized groups of birds

* 21. Point count techniques can often be modified to better survey cryptic or uncommon birds.

Playbacks of species calls can dramatically increase the detection of almost any species, however they preclude comparisons with unaided surveys. Nocturnal point counts can be used to survey owls and caprimulgids and are especially effective when used in conjunction with taped calls. Johnson and Zwank (this volume) discuss methodologies for monitoring nocturnal birds and Gibbs and Melvin (this volume) discuss monitoring marsh birds, using call-response surveys.

Additional Recommendations:

The following recommendations should help further standardize the collection of point count data among projects.

* 22. Counts should begin immediately when the observer reaches the census station.

* 23. A bird flushed within 50 m of a station's center as an observer approaches or leaves a station should be counted as being at the station if no other individual is seen during the count period. It is advisable that this is recorded separately.

* 24. If a flock is encountered during a census period, it may be followed after the end of the period to determine its composition and size. An observer should follow such a flock for no more than 10 minutes. This is especially useful during the winter.

* 25. A bird giving an unknown song or call may be tracked down after count period for confirmation.

* 26. No attracting devices or records should be used, except in counts for specialized groups of birds.

* 27. Latitude and longitude for each location should be recorded to the nearest xx th of a second from accurate topographic maps.

* 28. It is important to minimize the time that an observer spends looking at the sheet of paper while recording, so as to maximize visual observations.

Literature Cited

Best, L. B. 1981. Seasonal changes in detection of individual bird species. pp. 252-261 in C.J. Ralph and J.M. Scott (Eds.) Estimating Numbers of Terrestrial Birds. Studies in Avian Biology 6.

Blondel, J., C. Ferry, and B. Frochot. 1981. Point counts with unlimited distance. pp. 414-420 in C.J. Ralph and J.M. Scott (Eds.) Estimating Numbers of Terrestrial Birds. Studies in Avian Biology 6.

Cochran, R. 1977. Sampling techniques. Wiley, N.Y.

Faanes, C. A. and D. Bystrak. 1981. The role of observer bias in the North American Breeding Bird Survey. pp. 353-359 in C.J. Ralph and J.M. Scott (Eds.) Estimating Numbers of Terrestrial Birds. Studies in Avian Biology 6.

Kepler, C. B. and J. M. Scott. 1981. Reducing bird count variability by training observers. pp. 366-371 in C.J. Ralph and J.M. Scott (Eds.) Estimating Numbers of Terrestrial Birds. Studies in Avian Biology 6.

Koskimies, P. and R.A. Vaisanen. 1991. Monitoring bird populations. Zoological Museum, University of Helsinki, Finland.

Manuwal, D.A. and M. Huff. 1987. Spring and winter bird populations in a Douglas-fir forest sere. Journal of Wildlife Management 51:586-595.

Ralph, C. J. and J. M. Scott (eds.). 1981. Estimating numbers of terrestrial birds. Studies in Avian Biology 6, 630 pp.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A variable circular-plot method for estimating bird numbers. Condor 82:309-313.

Robbins, C. S. 1981a. Effect of time of day on bird activity. pp. 275-286 in C.J. Ralph and J.M. Scott (Eds.) Estimating Numbers of Terrestrial Birds. Studies in Avian Biology 6.

Robbins, C. C. 1981b. Bird activity levels related to weather. pp. 301-310 in C.J. Ralph and J.M. Scott (Eds.) Estimating Numbers of Terrestrial Birds. Studies in Avian Biology 6.

Sukhatme, P.D., B.V. Sukhatme, S. Sukhatme, and C. Asok. 1984. Sampling theory of surveys with applications. Iowa State Univ. Press. Ames, Iowa. 526 pp.

Verner, J. 1985. Assessment of counting techniques. Current Ornithol. 2:247-302.

Verner, J. 1988. Optimizing the duration of point counts for monitoring trends in bird populations. U.S.D.A. Forest Service, Pacific Southwest Forest and Range Experiment Station, Research Note PSW-395. 4pp.

APPENDIX A

Field sheets, involving mapping of birds and the use of 'tick' marks.

* * * Announcement * * *

First Annual
NORTH AMERICAN MIGRATION COUNT
9 MAY 1992

Have you ever wondered "What is the *Shape* of migration?" It all depends on your viewpoint. Waterfowlers have benefitted from the extensive studies of the U.S. Fish and Wildlife Service in their role for managing the Nation's game species resource. Hawk watchers may think of it as "Rivers" and space themselves on ridges and prominent peninsulas like the Marin Highlands, Whitefish Point, the Blue Mountain Ridges, and Cape May, to count the flow. Shorebirders look at it as "Island Hopping" and go to the "islands" of Bodega Bay, Mono Lake, Bear River, Galveston, Cheyenne Bottoms, Higbee's Beach, and Pea Island. All of these have lead to efforts to preserve and protect critical habitat for migration: we now have the National Wildlife Refuge System, Hawk Mountain, and the Delaware Bay Beaches. But what of Songbirds?

By what paths do neotropical migrants move from Central and South America to their breeding grounds? Do American Redstarts line up in military style and move north as solid front, leaving occupying forces along the way? Perhaps Wood Thrushes are like blood flowing through major arteries before anastomosing into capillaries. Think of Kingbirds lining up like the runners in the New York Marathon and visualize the spread after the starter's pistol. Maybe Purple Martins move like ducks, geese and swans, with colonies making a series of short hops along a predictable route. It may seem wild, but do Bobolinks migrate like shorebirds, with a series of widely spaced discrete essential stops?

Most of you have participated on the Christmas Bird Counts sponsored By the National Audubon Society. The rules are simple: spend a day in the field counting birds in a specified area, and keep track of hours & miles on foot, car, boat, feeder watching. The **North American Migration Count** is like the Christmas Bird Count, but with a few twists. The <u>Area</u> for any one count is not a 15 mile diameter circle, but an <u>entire County</u> [Parish for Louisiana]. The big twist is the timing: unlike Christmas Bird Counts, which are spread over a few weeks, this count is done on just a <u>single day</u> across the entire 48 States.

The choice of the Second Saturday in May has been made to try to find the peaks of movement of neotropical species while they are still in the lower 48 States. It will not be peak everywhere: the Northern States will be getting the first glimmer of Spring and the Deep South will be in early Breeding Season, but the overall goal is of importance to everyone.

At the moment this is a Grass Roots project which can succeed with your help. Organize a Count for your County or all of the counties in your State.

For more information contact:

Jim Stasz
NAMC Coordinator
P.O. Box 71
North Beach, Maryland
20714

p.s. Pass this along