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COMMENTARY

Reviving common standards in point-count surveys for broad inference across studies

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ABSTRACT

We revisit the common standards recommended by Ralph et al. (1993, 1995a) for conducting point-count surveys to assess the relative abundance of landbirds breeding in North America. The standards originated from discussions among ornithologists in 1991 and were developed so that point-count survey data could be broadly compared and jointly analyzed by national data centers with the goals of monitoring populations and managing habitat. Twenty years later, we revisit these standards because (1) they have not been universally followed and (2) new methods allow estimation of absolute abundance from point counts, but these methods generally require data beyond the original standards to account for imperfect detection. Lack of standardization and the complications it introduces for analysis become apparent from aggregated data. For example, only 3% of 196,000 point counts conducted during the period 1992–2011 across Alaska and Canada followed the standards recommended for the count period and count radius. Ten-minute, unlimited-count-radius surveys increased the number of birds detected by >300% over 3-minute, 50-m-radius surveys. This effect size, which could be eliminated by standardized sampling, was ≥10 times the published effect sizes of observers, time of day, and date of the surveys. We suggest that the recommendations by Ralph et al. (1995a) continue to form the common standards when conducting point counts. This protocol is inexpensive and easy to follow but still allows the surveys to be adjusted for detection probabilities. Investigators might optionally collect additional information so that they can analyze their data with more flexible forms of removal and time-of-detection models, distance sampling, multiple-observer methods, repeated counts, or combinations of these methods. Maintaining the common standards as a base protocol, even as these study-specific modifications are added, will maximize the value of point-count data, allowing compilation and analysis by regional and national data centers.

Keywords: avian point count, breeding bird abundance, detection probability, landbirds, landscape-scale, meta-analysis, monitoring, survey techniques

Relancer les normes communes dans les inventaires par points d'écoute pour une vaste inférence dans les études

RÉSUMÉ

Nous revisitons les normes communes recommandées par Ralph et al. (1993, 1995a) pour réaliser des inventaires par points d'écoute afin d'évaluer l'abondance relative des oiseaux terrestres se reproduisant en Amérique du Nord. Les normes tirent leur origine de discussions entre ornithologues en 1991 et ont été développées afin que les données de points d'écoute puissent être globalement comparées et conjointement analysées par des centres nationaux de données dans le but de suivre les populations et de gérer l'habitat. Vingt ans plus tard, nous avons revisité ces normes car (1) elles n'ont pas été suivies universellement et (2) de nouvelles méthodes permettent d'estimer l'abondance absolue à l'aide des points d'écoute, mais ces méthodes nécessitent généralement des données allant au-delà des normes originales pour tenir compte d'une détection imparfaite. Le manque de standardisation et les complications qu'il introduit dans les analyses deviennent apparents avec des données agrégées. Par exemple, seulement 3% des 196 000 points d'écoute effectués entre 1992 et 2011 en Alaska et au Canada ont suivi les normes recommandées en ce qui concerne la période et le rayon de dénombrement. Les dénombrements de dix minutes avec rayon illimité augmentaient le nombre d'oiseaux détectés de >300% par rapport aux inventaires de 3 minutes dans un rayon de 50 m. Cette ampleur de l'effet, qui pourrait être éliminée avec un échantillonnage standardisé, était ≥10 fois celles de l'effet des observateurs, du moment de la journée et de la date des inventaires publiés. Nous suggérons que les recommandations de Ralph et al. (1995a) continuent à constituer les normes communes lors de la réalisation de points d'écoute. Ce protocole est peu coûteux et facile à suivre, tout en permettant de tenir compte des probabilités de détection dans les inventaires. Les chercheurs pourraient optionnellement recueillir des informations supplémentaires afin d'analyser leurs données avec des modèles plus flexibles du temps de détection et des formes de retrait, l'échantillonnage par la distance, des méthodes à observateurs multiples, des dénombrements répétés ou une combinaison de ces méthodes. Le maintien des normes communes comme protocole de base, même si des modifications spécifiques sont ajoutées à l'étude, maximisera la valeur des données des points d'écoute, tout en permettant la compilation et l'analyse par des centres régionaux et nationaux de données.

Mots-clés: abondance des oiseaux nicheurs, échelle du paysage, méta-analyse, oiseaux terrestres, point d'écoute aviaire, probabilité de détection, suivi, techniques d'inventaire

Point-count surveys (Blondel et al. 1970, 1981) are the most widely used technique for surveying terrestrial birds in North America (Rosenstock et al. 2002, Bart 2005, Simons et al. 2007; Figure 1). This method generally involves having a trained observer stand at a location (count station) and record all the birds that are detected during a set amount of time (count period) within a fixed or unlimited distance away from the count station (count radius). Point counts have been used to estimate relative or absolute abundance of birds for a wide variety of purposes, such as population monitoring, understanding bird–habitat relationships, assessing the effects of landscape changes on bird populations, and setting population goals for conservation (Ralph et al. 1995b, Scott et al. 2002, Rich et al. 2004, Fontaine and Kennedy 2012, Sauer et al. 2013). Use of this relatively inexpensive and easy method proliferated across North America in the 1990s, largely as a result of widespread concerns for declining populations of Neotropic–Nearctic migrant songbirds (Ralph et al. 1993, 1995c). Avian researchers recognized this surge in interest and convened in 1991 to share their research findings on how to optimize point-count surveys for efficiency and precision as indices of relative abundance (Ralph et al. 1995b). They then used this information to develop a set of common standards on how point-count surveys should be established and conducted so that resulting indices of abundance would be widely comparable across years, habitats, and studies and could therefore be jointly stored and analyzed by national data centers.

Twenty years later, it is timely to revisit the common standards for two reasons. First, the era of standardizing point-count surveys as indices of relative abundance (1980s–1990s; Ralph and Scott 1981, Ralph et al. 1993, 1995a, 1995b) was soon followed by an era of innovation in how point-count surveys could be modified to estimate the proportion of birds that were present but undetected during the surveys (Thompson 2002, Johnson 2008, Nichols et al. 2009). This shift, from analyzing raw point counts as indices of relative abundance to analyzing adjusted counts as estimates of absolute abundance, has diversified point-count methodologies and changed views on how surveys should be designed to meet data requirements and assumptions of new analytical techniques. We briefly review these modifications to highlight important protocol changes since Ralph et al. (1993, 1995a). Second, a growing number of programs are compiling large point-count datasets for regional and national analyses of avian distribution, abundance, habitat use, and population trends (Wimer et al. 2006, Ballard et al. 2008, Iliff et al. 2009, Koch et al. 2010), often revealing that common standards were not universally followed (Cumming et al. 2010). We provide an example of the extent of variability in point-count protocols among 125 studies across northern North America and how this lack of standardization greatly complicates collective analyses of survey data. This example underscores our contention that the need for common standards is as relevant today as it was in 1991. We consider this point worth emphasizing as we enter an era of data-intensive analyses of large compiled datasets (Kelling et al. 2009). We anticipate ever more analysis of compiled datasets as computing power improves, the availability of citizen-science contributions increases, and data sharing becomes a mandatory aspect of research (Dickinson et al. 2010, Reichman et al. 2011, Hampton et al. 2013, Costello and Wieczorek 2014). Clearly, standardization of point-count surveys could provide great benefits (Ralph et al. 1995a, Cumming et al. 2010).

Accounting for Imperfect Detection during Point Counts

The common standards by Ralph et al. (1993, 1995a) focused almost entirely on using point counts as indices of relative abundance. They emphasized standardization to maximize efficiency in the numbers of birds and species counted, and to minimize extraneous variability in the counts. The latter was to ensure that a relatively constant proportion of the birds present was detected across the spatial or temporal units of comparisons—a paramount feature of an effective index (Johnson 2008). In the 2000s, ornithologists began shifting away from conducting point counts as indices of relative abundance, instead conducting surveys to estimate absolute abundance (Johnson 2008, Nichols et al. 2009). This change was motivated by growing concerns that variable detection probabilities might bias indices of abundance from important point-count programs

FIGURE 1. Point-count surveys are conducted throughout North America to assess and monitor the relative abundance of breeding landbirds. These surveys primarily count displaying males, such as this Wilson's Warbler (*Cardellina pusilla*) singing in a boreal forest in Denali National Park and Preserve, Alaska. We remind investigators to conduct point counts in accordance with the common standards by Ralph et al. (1993, 1995a), because this allows their survey data to be compiled and analyzed more easily by national data centers. Photo credit: Ted Swem

like the North American Breeding Bird Survey (BBS; O'Connor et al. 2000), and by the growing use of estimates of population size to both set and measure progress toward achieving avian conservation goals (U.S. NABCI Committee 2000, North American Waterfowl Management Plan 2004, Rich et al. 2004, Will et al. 2005). Distance sampling (Ramsey and Scott 1979, Reynolds et al. 1980, Buckland et al. 2001) became more widely used, and several closed-population models were newly applied to point counts to adjust surveys for detection probabilities (see reviews in Pollock et al. 2002, Thompson 2002, Johnson 2008, Nichols et al. 2009).

Although largely analytical, the movement from indices to estimates of absolute abundance also diversified point-count protocols. This is because each of the many abundance estimators now applied to point counts requires the surveys to be conducted in relation to multiple levels of one or more factors: observers (multiple-observer models; Nichols et al. 2000, Alldredge et al. 2006), count radii (distance-sampling models), count periods (removal and time-of-detection models; Farnsworth et al. 2002, Alldredge et al. 2007a), or visits (binomial N-mixture and site-occupancy models; Royle 2004, MacKenzie et al. 2005). The complexity of the detection process that can be modeled by each of these abundance estimators generally increases with increases in the number of factor levels collected for the ancillary data. The simplest forms of these abundance estimators can be applied to the data collected following the common standards, or the standards with only minor modifications (Table 1), thereby adding considerable value to a great number of existing datasets (Farnsworth et al. 2005). For example, the standardized data can be analyzed with a combination of removal models and distance sampling to adjust the surveys for the effects of two principal factors influencing detectability of songbirds (Alldredge et al. 2007c): detection distances and singing rates (Table 1; Farnsworth et al. 2005, Sólymos et al. 2013, Amundson et al. 2014).

The more flexible forms of the abundance estimators that incorporate individual heterogeneity in detection probabilities require the surveys to be conducted using more—often many more—count periods, count radii, observers, or visits than prescribed by Ralph et al. (1993, 1995a). There is now a confusing array of protocols in which point counts can be conducted to adjust for imperfect detection, and possibly an even greater number of unresolved questions about whether the challenging data requirements and assumptions of the complicated forms of the abundance estimators can be met (Table 1). For example, recording the exact distances to each detected bird maximizes flexibility for analyzing the data using distance sampling (Buckland et al. 2001), but it may also increase violations of the assumption that birds are assigned to distance intervals without error (Alldredge et al. 2007b, 2008). Similarly, lengthening the count period beyond 0–3 or 3–5 min by adding the interval 5–10 min has benefits in modeling individual heterogeneity and increasing the overall detection probability at a point (Barker et al. 1993, Alldredge et al. 2007a), but it increases probabilities that birds are recorded in the wrong time interval by observers (Simons et al. 2009) or move during the counts, a violation of the closure assumption tied to most abundance estimators (Farnsworth et al. 2002, Nichols et al. 2009). There are parallel tradeoffs between collecting the ancillary data and violating the assumptions of the other abundance estimators as well (Johnson 2008, Efford and Dawson 2009, 2012, Rota et al. 2009, Simons et al. 2009, Chandler et al. 2011). Unfortunately, the literature on the new abundance estimators has rarely provided guidance on how or whether data collections should be kept consistent with the common standards (but see Farnsworth et al. 2005). While abundance estimators potentially strengthen inferences about avian abundance from individual studies (Nichols et al. 2009), they have complicated point-count protocols and may be inadvertently steering some investigators away from standardized data-collection consistent with Ralph et al. (1993, 1995a).

Variable Point-count Protocols across Northern North America

The Boreal Avian Modelling Project (BAM) recently compiled point-count data from 125 disparate inventory, monitoring, research, and impact-assessment projects

TABLE 1. Attributes of point-count survey protocols that are required by abundance estimators to adjust the surveys for detection probabilities.[a] The simplest forms of distance sampling (Buckland et al. 2001) and removal models (Farnsworth et al. 2002) can be applied to the surveys following the common standards of Ralph et al. (1993, 1995a). Investigators often collect additional information beyond the common standards to apply more flexible forms of distance sampling and removal models or, alternatively, time-of-detection models (Alldredge et al. 2007a), multiple-observer methods (Nichols et al. 2000, Alldredge et al. 2006, Riddle et al. 2010), N-mixture models (Royle 2004), or site-occupancy models (MacKenzie et al. 2005). We specify the parameters estimated by these models as well as the potential drawbacks of collecting the additional data (Johnson 2008, Nichols et al. 2009). (*Continued on next page.*)

Attribute of protocol	Common standards	Abundance estimators as applied to common standards	Optional additional data [b]
Count radius	First detections recorded in distance intervals of 0–50 m and ≥51 m (unlimited).	Half-normal, binomial distance-sampling models of p_d.	First detections recorded as exact distances (ideal) or in ≥4 distance intervals (e.g., 0–25, 26–50, 51–100, >100 m).
Count period	First detections recorded in intervals of 0–3, 3–5, and, optionally, 5–10 min.	Removal model with p_a p_d uniform (2 time intervals) or heterogeneous between groups of birds with low p (estimated) vs. high p (fixed at 1; 3 time intervals only).	■ First detections recorded in ≥4 time intervals (e.g., 0–3, 3–5, 5–8, 8–10 min). ■ First and subsequent detections of each bird are recorded in ≥4 time intervals, forming a full capture–recapture history.
Number of observers	1	NA	≥2
Number of visits	1	NA	≥2

[a] The probability (p) of detecting a territorial bird whose home range intersects the survey area is the product of 3 probabilities: that the bird is present in the portion of its territory overlapping the survey area (p_p); that it provides a visual or auditory cue, given that it is present (p_a); and that it is detected by an observer, given that it is present and providing a cue (p_d). Adjusting the counts for p_p results in an estimate of the superpopulation, the number of territories overlapping a site, which cannot be used to estimate density or population size because the area effectively sampled is unknown (Nichols et al. 2009).

[b] We recommend that investigators maintain the common standards by Ralph et al. (1993, 1995a) as a base protocol when collecting these additional data. For example, if surveys are conducted using additional distance intervals, 50 m should be maintained as one of the cut-points. This will allow the data to be shared more broadly and jointly analyzed as part of regional or national data centers.

conducted since 1992 across Canada and Alaska. The BAM database included 196,353 surveys at 129,617 point-count survey locations as of March 2012. Most of the surveys were conducted in boreal forest or hemiboreal regions (Brandt 2009), but the database also includes surveys in adjacent temperate and Arctic biomes. The central goals of this program are to (1) provide reliable estimates of breeding abundance and population size and (2) assess the relative importance of different habitats, climates, and geopolitical jurisdictions to various species of birds across the region (Cumming et al. 2010, 2014, Mahon et al. 2014, Stralberg et al. 2014). We explored the BAM database in relation to common standards for two areas of protocol—the count period and the count radius—to reemphasize that counts of birds increase in a nonlinear fashion with a lengthening of either count period or count radius (Ralph et al. 1995b, Buckland et al. 2001, Farnsworth et al. 2002), and that standardization of these components of protocol is important if the data from different studies are to be directly compared or jointly analyzed. Our analysis does not include data from the BBS, which was not the focus of the recommendations by Ralph et al. (1993, 1995a).

Ralph et al. (1993, 1995a) made two recommendations regarding count period: (1) The time spent at each point-count station should be 5 or 10 min, depending on travel time between points; and (2) the data should be separated into those individuals first seen or heard in the intervals 0–3, 3–5, and 5–10 min, the latter only for a 10-min count. The interval 0–3 min was recommended so that the surveys could be directly compared to the 3-min surveys conducted as part of the BBS. In addition to 0–3 min, the

TABLE 1. Continued.

Attribute of protocol	Added flexibility in modeling p with the optional data	Added problems with collecting additional data
Count radius	■ Outlier distances can be truncated to improve the fit of distance-sampling models. ■ Multinomial distance-sampling offers a variety of key detection functions and adjustment terms to improve model fit.	Increased errors in correctly assigning birds to distance intervals, particularly auditory detections >50 m from the point.
Count period	■ Removal models with p_a p_d heterogeneous among groups of birds. ■ Time-of-detection models with p_a p_d variable among time intervals, between first and later detections, among groups of birds, and bivariate combinations of these.	■ Errors in assigning birds to narrow time intervals, especially the first interval. ■ Errors in tracking individual birds across time intervals, especially when birds are numerous.
Number of observers	■ Double-observer method with p_d uniform or variable within pairs of observers. ■ Multiple-observer methods with ≥4 observers allow for heterogeneous p_d among groups of birds. ■ Double-observer, mark–recapture distance sampling (Laake et al. 2011) relaxes the assumption that all birds are detected at the point.	■ Increases personnel needed for each survey. ■ Introduces errors in matching observations between observers, especially when birds are numerous. ■ Presence of additional observers may influence bird behavior or counts by other observers. ■ Using 4 observers worsens these problems.
Number of visits	■ Increases coverage of optimal survey periods of resident vs. migrant birds. ■ N-mixture and site-occupancy models of p_a p_d p_p.	■ Movement of birds in and out of plots between visits violates assumptions of geographic closure.

interval 3–5 min was recommended so that a portion of the data from 10-min surveys could be directly compared to a 5-min survey. All the surveys compiled by BAM followed the recommended count period of either 5 min (79% of surveys) or 10 min (21% of surveys). However, only 7% of the surveys included the interval 0–3 min, and 48% of the 10-min surveys included the interval 0–5 min. Overall, only 4% of the surveys in the BAM database met both criteria for the count period.

Ralph et al. (1993, 1995a) made two recommendations regarding count radius: (1) All individual birds detected at a count station should be recorded, which implies that unlimited-distance surveys should be conducted; and (2) birds first detected within 50 m of the point should be recorded separately from birds detected beyond 50 m. They recommend counting all species to an unlimited distance in order to maximize the number of birds detected. Counts within 50 m of the point-count station would allow comparisons of abundance among species because species' differences in detection rates would be minimized within this small count radius. In the BAM database, 79% of surveys were conducted with an unlimited survey radius, and 37% included a 50-m cut-point. Overall, only 17% of the surveys met both criteria for the count radius.

Within the BAM database, there were 49 different combinations of how projects applied count period, count radius, and subintervals. Only 3% of the surveys adhered to all four of the recommendations by Ralph et al. (1993, 1995a) for the count period and radius. Thus, it is clear that the surveys compiled by BAM were not widely standardized for these two areas of protocol. Using the 3% of surveys that followed the common standards, we examined how the number of detections for each species varied with each protocol combination of count period (3, 5, or 10 min) and count radius (50 m or unlimited). We rescaled the survey data for each of 54 species with ≥75 detections by dividing a species' mean number of detections for each protocol combination by the species' mean number of detections for the 3-min, 50-m count radius. This standardized the mean numbers of detections across species to a value of 1 for the 3-min, 50-m count radius and helped us illustrate how numbers of detections increase as the count period and count radius are lengthened.

Across species, numbers of detections increased by an average (± SE) of 312 ± 34% from a 3-min, 50-m-radius survey to a 10-min, unlimited-radius survey (Figure 2). The count radius had a particularly large effect on numbers of detections. When the count radius for a 10-min survey was increased from 50 m to an unlimited radius, numbers of detections increased by an average of 171 ± 23%. Lengthening of the count period had a smaller effect on

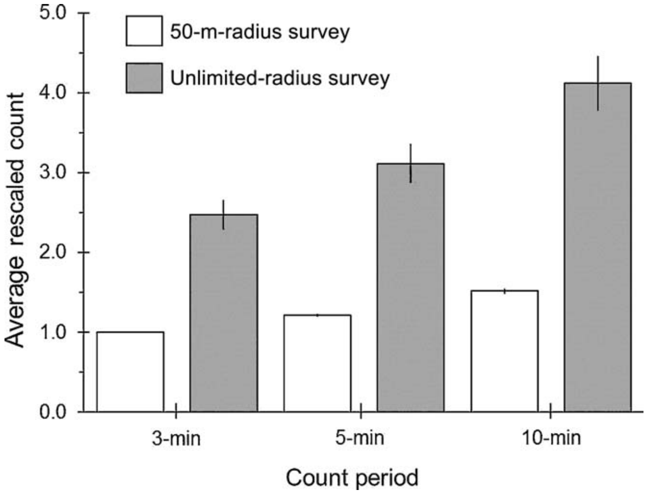

FIGURE 2. Increase in the mean number of individuals detected (± SE) across 54 species of boreal songbirds as the point-count period and radius are lengthened. The point counts were conducted across Canada and Alaska during the period 1992–2011. We rescaled numbers of detections for each species in relation to a 3-min, 50-m-radius survey to standardize the counts across species and to illustrate the nonlinear increase in detections as survey effort is increased.

numbers of detections, which increased by an average of 25 ± 1% and 65 ± 3% when the 3-min count period was increased to 5 and 10 min, respectively, for unlimited-radius surveys (Figure 2). The effect size of point-count protocol on the number of boreal birds detected (312%) was an order of magnitude larger than the published effect sizes of observers, time of day, and date of survey for point counts conducted in Great Smoky Mountains National Park (Farnsworth et al. 2002). Averaged across 4 passerines, the mean number of birds detected by Farnsworth et al. (2002) increased by 12% from observers with lowest to highest average numbers of detections, by 21% from dates with lowest to highest detections, and by 20% from times of day with lowest to highest detections. Thus, the large differences in numbers of avian detections due to differences in protocol clearly limit which surveys can be directly compared and how they can be jointly analyzed (Cumming et al. 2010, Reidy et al. 2011).

Contrary to the vision of Ralph et al. (1993, 1995a), the surveys compiled by BAM must first be adjusted for differences in protocol before valid comparisons can be made broadly across the dataset (Cumming et al. 2010). Sólymos et al. (2013) recently modified distance sampling and removal models of detection probabilities (p) to account for variable count periods, count radii, and environmental covariate effects, allowing analysis of BAM data. Among 39 species of boreal passerines, 66% of the variability in detection probabilities from point-count surveys was attributable to species, 14% to count radius, 4% to count period, and 4% to time of day, time of year, and habitats combined (Sólymos et al. 2013). This is consistent with experimental point counts using bird songs broadcast from speaker arrays, which showed that detection probabilities were far more sensitive to differences in distance between observers and singing birds ($\bar{p}$ declined by 88% from 30 to 150 m) than to differences in singing rates ($\bar{p}$ declined by 13% from high to low singing rates) or observer abilities ($\bar{p}$ declined by 10% from best to worst observers; Alldredge et al. 2007c: table 5). Thus, the effects of species and survey protocol on detection probabilities may often far outweigh the effects of environmental covariate and observer on detection probabilities during point counts.

While detection probabilities provide a means of addressing protocol differences, their estimation requires the surveys to be conducted with multiple subintervals for count period and count radius (Matsuoka et al. 2012, Sólymos et al. 2013); only 11% of the BAM surveys were conducted using multiple subintervals for count period and radius. Thus, BAM must assume that the adjustments calculated from this subset of surveys are representative and can therefore be applied across the entire dataset (Pollock et al. 2002). This is a challenging assumption to meet because (1) protocols were not randomly assigned to surveys and (2) the ratio of numbers of avian detections between count periods and between count radii can vary with a multitude of factors (Johnson 2008: table 1). Better adherence to standard protocols will help minimize these problems and enable survey-specific adjustments for detection probability in future analyses of compiled datasets. Collecting BBS data using multiple subintervals of the count period and count radius will similarly allow the modeling of detection probabilities (Farnsworth et al. 2005, Somershoe et al. 2006, Marques et al. 2010), which can strengthen extrapolations of roadside survey results to off-road areas and improve analyses that combined roadside and off-road survey data (O'Connor et al. 2000, Thogmartin et al. 2006, Matsuoka et al. 2012).

A Simple Reminder to Follow the Common Standards

The impetus for developing the common standards for point-count surveys in 1991 was to guide investigators toward conducting point counts as indices of avian abundance that could be broadly shared and collectively analyzed to better inform bird conservation and management (Ralph et al. 1993, 1995a). Twenty years later, half of this vision has been realized: (1) point-count data have now been shared across hundreds of studies as part of regional and national data centers, but (2) analysis has been challenging because of variable methods. We therefore offer a simple reminder to investigators to follow the common standards whenever possible when conducting point-count surveys (Ralph et al. 1993, 1995a).

We continue to advocate the common standards because they are relatively inexpensive and easy to follow, they have proved useful in a wide range of applications, and the resulting data can be analyzed with simple forms of abundance estimators to adjust for survey-specific detection probability (Farnsworth et al. 2002, 2005, Thompson and La Sorte 2008, Etterson et al. 2009, Reidy et al. 2011, Matsuoka et al. 2012, Sólymos et al. 2013). The common standards include a wealth of useful recommendations on the design and conduct of surveys (Ralph et al. 1993, 1995a), nearly all of which are as pertinent today as they were 20 yr ago. In summary, the standards call for a single-observer, single-visit omnibus survey at each count station for a 5-min or 10-min count period. During a survey, an experienced and highly trained observer records the first detection of each observed bird by species and within (1) the intervals 0–3, 3–5, and, optionally, 5–10 min; and (2) the interval 0–50 and distance $\geq$51 m (unlimited). We also agree with Ralph et al. (1995a) that the count radius should be further divided into the intervals 0–25, 26–50, 51–100, and $>$100 m whenever possible. Although this recommendation was initially made to tailor a fixed count radius to habitats of different vegetation density, thereby enabling simple comparisons of avian abundance among species (Ralph et al. 1995a), using multiple distance bands will now allow analysts to fit more flexible multinomial distance-sampling models to the data (Rosenstock et al. 2002, Farnsworth et al. 2005, Thompson and La Sorte 2008). We also add that investigators should use a geographic positioning system to record the location and associated geodetic datum (e.g., WGS 84) of each point-count station to a 1-m resolution (e.g., UTM or decimal degrees to 5 decimal places).

If investigators wish to use the more flexible forms of abundance estimators now available for analyzing point-count data, they might consider conducting the surveys with additional time intervals, distance intervals, observers, or visits (Table 1). Doing so will help model heterogeneity in the detection process using the abundance estimators individually or in combinations (Alldredge et al. 2007a, Stanislav et al. 2010, Chandler et al. 2011, Laake et al. 2011, Amundson et al. 2014). However, we recommend that investigators carefully consider their study objectives and then weigh the added costs, difficulties, and potential errors associated with collecting the additional data against the sometimes small-to-modest gains in accuracy and precision afforded by the more complicated abundance estimators (Johnson 2008, Thompson and La Sorte 2008). When undertaking these more complex data collections, we suggest that investigators maintain the common standards whenever possible (Table 1) because this allows their data to be more easily combined and analyzed with other datasets. For example:

- Investigators who choose to record the observations using more distance or time intervals than prescribed by Ralph et al. (1993, 1995a) should include among their cut-points the 3-min, 5-min, and 10-min intervals and the 50-m and unlimited-distance intervals.
- If multiple observer methods are used, then one (Nichols et al. 2000) or all observers (Alldredge et al. 2006, Riddle et al. 2010) should conduct an independent survey that is not influenced by the presence of the other observers. The data from the multiple-observer surveys should be clearly separated by observer, and only one of the replicates should be combined and jointly analyzed with data from single-observer surveys.

Compliance with the common standards therefore requires investigators to follow a simple base protocol, but it also affords them great flexibility in how they can collect additional ancillary data to meet their specific project needs. This flexibility is important because (1) observers' abilities to collect complicated ancillary data will vary considerably among projects using mostly volunteers versus primarily highly trained research staff (O'Connor et al. 2000); and (2) views on point-count protocols will continue to change, particularly as there remains considerable disagreement on which methods are best for conducting and analyzing point counts (Ellingson and Lukacs 2003, Hutto and Young 2003, Johnson 2008, Efford and Dawson 2009, Simons et al. 2009). Reviving the common standards avoids the debates about methodology and moves the discussion back to how, collectively, we can best use our survey data to understand and address the large-scale issues facing bird populations. We agree with Hutto and Young (2003:908) that if "we collect point-count data the same way that everyone else does," then "differences in opinion…should not hamper the ability to share data."

Over the past 20 yr since the development of the common standards (Ralph et al. 1993, 1995a), researchers have journeyed from standardizing point-count protocols to innovating point-count methods and analyses, and perhaps back again, full circle, to standardization. However, the decades of labor dedicated both to improving the point-count survey method and to collecting and sharing data across studies have certainly been true to the sentiments expressed by Ralph et al. (1995a:169) in noting that "the cooperative effort that went into these standards shows the sincerity that all involved will continue to put toward this effort." May future efforts to conduct, compile, and analyze point-count surveys continue forward in this good spirit—but hopefully, this time around, with a more consistent commitment to standardization.

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