Completeness_Report_NABBS_Dataset_1966-2019.pdf (06/22/2020)

This file is an addendum to the "Completeness Report" section of the metadata file "MetaData_NABBS_Dataset_1966-2019.xml". It describes the scope of the BBS dataset.

The BBS is an ongoing annual survey. This data set is considered complete at the time of release. Late data returns not included in this release will be included in subsequent releases. BBS Data are housed in MS-SQL 2014 database. Numerous scripts and SQL queries developed by USGS staff (BBSRetrievalData_V1.5) are used to repackage data into the flat files for the data set release. Users are advised to read the entire metadata record for further details.

1) The BBS data provide an index of population abundance, not a complete count of birds at a stop or on a route. Only those birds visible or audible to the observer during the 3-minute point count period are identified to species, or appropriate BBS taxa group, and enumerated. Weather, habitat, bird activity levels, time of day, ambient noise, human abilities, and much more may affect detection rates of birds. The BBS controls for many of these factors by utilizing a rigorous and standardized sampling protocol. (see Sauer et al. 2019 for discussion of effects of protocol change on BBS counts.). Nevertheless, incorporation of covariates like observer effects have been shown to play an important role in mitigating bias when analyzing BBS data. Other important factors include first-time observer effect and sample density.

Faanes, C. A. and D. Bystrak. 1981. The role of observer bias in the North American Breeding Bird Survey. Pages 353-359 in C. John Ralph and J. Michael Scott Estimating Numbers of Terrestrial Birds. *Studies in Avian Biology* 6., 630 pp. http://sora.unm.edu/node/49.

Kendall, W. L., B. G. Peterjohn, and J. R. Sauer. 1996. First-time observer effects in the North American Breeding Bird Survey. *The Auk* 113(4):823-829. http://sora.unm.edu/node/25734.

Link, W. A. and J. R. Sauer. 1997. Estimation of population trajectories from count data. *Biometrics* 53(2):488-497. DOI: 10.2307/2533952 https://www.jstor.org/stable/2533952.

Sauer, J. R., W. A. Link, and J. A. Royle. 2004. Estimating population trends with a linear model: technical comments. *The Condor* 106(2):435-440. http://www.bioone.org/perlserv/?request=get-abstract&doi=10.1650/7431.

Sauer, J. R. and W. A. Link. 2011. Analysis of the North American Breeding Bird Survey using hierarchical models. *The Auk* 128(1):87-98. DOI: 10.1525/auk.2010.09220 https://www.jstor.org/stable/10.1525/auk.2010.09220.

Sauer et al. 2019. Consistency counts: Modeling the effects of a change in protocol on Breeding Bird Survey counts. *The Condor*, Volume 121, Issue 2, 1 May 2019, duz009. https://doi.org/10.1093/condor/duz009.

2) Breeding bird species. Breeding birds are defined as any bird, except dependent young, detected within that species' known local breeding population range and within the accepted breeding season for the region where detected. No attempt is made to distinguish between paired and unpaired individuals. Migrant (a.k.a., migrant, vagrant or nonbreeding) species information has not been consistently

collected or stored for most of the survey's history due to survey's focus on breeding species. Steps were taken in 1999 to preserve "Migrant" information prospectively; "Migrant" data can be more accurately identified as "NOT-breeder" since the migrant data set contains all data not fitting into the "Breeding" category regardless of data quality.

3) Sample density (i.e., route density) varies across time and space. The survey was initiated in different years in different parts of its range. The BBS began in 1966 with about 500 routes sampled in the United States east of the Mississippi River and in Quebec and the maritime provinces of Canada. In 1967, the BBS expanded to the central United States, with a few routes in Ontario and Manitoba. By 1968 approximately 1200 routes were established and being sampled across the contiguous United States and southern half of all Canadian provinces, with only 2-3 routes being sampled in Alaska until the 1980s. Today there are around 5000 active routes of which approximately 3000 have been sampled annually since the mid-1990s. However, the same ~3000 routes are not necessarily sampled each year due to variety of reasons, including: poor weather conditions, safety concerns, and participant availability (e.g., illness). Many patterns occur in geographic coverage of the BBS. Some patterns occur as a consequence of logistics. BBS routes near human population centers tend to be consistently surveyed but remote routes are not surveyed every year, which causes regional variation in the efficiency of the survey (Robbins et al. 1986). Although all States and Provinces vary in coverage over time, some consistent regional patterns occur in BBS coverage. Route density varies geographically with regions in the northeast and southeast generally having higher route densities than most western and midwestern regions. For example, Maryland has approximately 14 routes per degree block, Alabama and Georgia have about 6 routes per degree block, and Nevada and Utah have about 2 routes per degree block. In Canada, routes are largely restricted to the southern half of the country; a pattern further reflected within individual provinces and territories.

Lawler, J. J., and R. J. O'Connor. 2004. How well do consistently monitored Breeding Bird Survey routes represent the environments of the conterminous United States? *The Condor* 106:801-814.

Robbins, C.S., D.A. Bystrak, and P.H. Geissler. 1986. The Breeding Bird Survey: its first fifteen years, 1965-1979. USDOI, Fish and Wildlife Service resource publication 157. Washington, D.C.

4) While sample locations (i.e., routes) are established using a stratified random process, they are constrained to roadsides except for a handful of water routes primarily in Alaska. This restricted sampling frame has raised questions regarding the influence of roadside bias. There are three primary concerns:

- A) Habitats along roads may not be representative of habitats in the landscape due to, for example, increased disturbance along roads or placement of roads;
- B) Counts may not be representative for some species due to differential attraction to, or avoidance of, roadside habitats;
- C) Counts along roads through time may not be representative due to differing rates of habitat change on roads versus off roads.

Habitat representation has been fairly well examined in the literature (Bart et al. 1995; Keller and Scallan 1999; Neimuth et al. 2007) with the most comprehensive studies to date (Veech et al. 2012, 2017) finding that for most of the 15 National Land Cover Database (NLCD) land cover types examined, the habitats within 400m of BBS routes are similar to habitats within 10,000m. Notable exceptions included a slight under-representation of open water habitat and a slight over-representation of developed open space near routes. Nevertheless, differences in local habitat quality or roadside attraction/avoidance effects may influence species abundance on roadside counts (Wellicome et al. 2014).

Bart, J., M. Hofschen, and B. G. Peterjohn. 1995. Reliability of the Breeding Bird Survey: Effects of restricting surveys to roads. *The Auk* 112:758-761.

Keller, C. M. E., and J. T. Scallan. 1999. Potential roadside biases due to habitat changes along breeding bird survey routes. *The Condor* 101:50-57.

Niemuth, N. D., A. L. Dahl, M. E. Estey, and C. R. Loesch. 2007. Representation of landcover along Breeding Bird Survey routes in the Northern Plains. *Journal of Wildlife Management* 71:2258-2265.

Veech, J. A., M. F. Small, and J. T. Baccus. 2012. Representativeness of Land Cover Composition along Routes of the North American Breeding Bird Survey. *The Auk* 129(2):259-267, (1 April 2012). https://doi.org/10.1525/auk.2012.11242.

Veech, J. A., K. L. Pardieck, and D. J. Ziolkowski, Jr. 2017. How well do route survey areas represent landscapes at larger spatial extents? An analysis of land cover composition along Breeding Bird Survey routes. *The Condor*, Volume 119, Issue 3, 1 August 2017, Pages 607–615, https://doi.org/10.1650/CONDOR-17-15.1

Wellicome, T. I., K. J. Kardynal, R. J. Franken, and C. S. Gillies. 2014. Off-road sampling reveals a different grassland bird community than roadside sampling: implications for survey design and estimates to guide conservation. *Avian Conservation and Ecology* 9(1): 4. http://dx.doi.org/10.5751/ACE-00624-090104

5) The BBS provides a “RunType” code to help data users quickly determine which data do or do not meet the BBS program’s data quality criteria. A RunType code of 1 is assigned whenever data were collected under conditions that meet BBS weather, date, time, and route completion criteria (QualityCurrentID = 1) on a randomly established route (i.e., RouteTypeDetailID = 1) using the official BBS sampling protocol (RPID = 101). Conversely, a RunType code of 0 indicates that data from a run fail to meet one or more of the aforementioned requirements. This could occur in one of 3 scenarios, or in combination, when: data exceed suitable date, time, weather, and/or route completion criteria (QualityCurrentID = 0), data were collected along a non-randomly established route (i.e., RouteTypeDetailID is not 1), and/or when the official BBS sampling protocol was not used (RPID [RunProtocolID] is not 101). See the file RunType.pdf file for more information.