Sixty-Two Years of Spring Bird Counts in Guilford County, North Carolina

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Introduction

Over the past 62 years (1957 - 2018), Guilford County birders have endured cold, hot, rainy and windy weather to count birds on a designated date each spring. Thanks to the sustained commitment of volunteers from the Piedmont Bird Club (PBC), we believe this effort represents the longest consecutive Spring Bird Count (SBC) conducted in any North Carolina county. The purpose of this report is to present some of the findings from this SBC. The report is organized as follows: First, we describe our count methodology. Second, the numbers of species and individual birds counted over the years are reported. Third, we describe levels of participant effort on count day. Fourth, we speculate about possible reasons for seeing or not seeing a particular species or larger or smaller numbers of individual birds on count day.

The SBC is normally held on the last Saturday in April or on the first Saturday in May. Over the past 62 years of counting, the dates have ranged from April 27 to May 7. The count is conducted within a count circle, which is a defined circle with a diameter of 15 miles. It is centered at Pisgah Church Road and Battleground Avenue in Greensboro. This census area includes urban and suburban settings as well as more rural areas located in the northern portions of the count circle. Four larger lakes (Higgins, Brandt, Townsend, Jeanette) as well as several smaller waterways and lakes provide open-water habitat. Additionally, the majority of Piedmont Triad International Airport (PTI Airport) is included within the count circle. However, access to this area has been severely curtailed over the past several years because of airport security concerns.

Methods

All living birds, except poultry and other exotic taxa, seen or heard in the count area on count day are recorded. Data from compiler's records were used (Piedmont Bird Club 2016). This report only presents data from count day because past inconsistencies in reports of additional species and their numbers seen during count week prevent summarizing those data. The effort of the "groups" of participants during count day is recorded in terms of the total number of hours spent (party hours), and miles travelled on foot or by car (party miles). The number of participants in a group or party generally ranges from one to five or more.

For the purposes of this paper, the following terms were used to describe the 'status' of each species recorded on count day. These terms are defined as follows: permanent resident (P) is present throughout the year; winter resident (W) resides in Guilford County throughout the winter months, but does not breed locally; summer resident (S) does not reside in Guilford County for the entire year but probably or definitely breeds locally; migratory species (M) are normally seen only during their migration season; rare (R) indicates a species that is not seen every year in the local area; accidental (A) indicates a species that is out of its normal range; its occurrence is completely unexpected and is seen less often than rare species; and vagrant (V) is a species whose occurrence is outside of its expected range, and is rarely seen (Koenig 2016, Hendrickson 2018, LeGrand and Haire 2018, McGowan 2018, Westphal 2018).

Results

Species: As a reference point, the total number of bird species reported in Guilford County across all seasons and years for which records have been kept currently stands at 316 species (Piedmont Bird Club, in press). The total number of species observed on count day across the 62 years is 234 and one other taxon, Lawrence's Warbler (Appendix 1). Appendix 1 presents the species listed in taxonomic order (American Ornithological Society 2018), the status of the species, the number of years the species was seen, the lowest and highest numbers of individual birds counted for each species, as well as the cumulative number (62-year sum) and average number of birds recorded for a given species.

On average 127 (SD = 10.6) different species have been observed each year. The lowest number of species seen on a count day was recorded on 24 Apr 1982 when just 104 species were observed in the count circle. The highest number of species recorded on a count day occurred on 30 Apr 1966. A total of 164 species was observed on that date.

Fifty-four species (23% of the 235 total) were counted in every one of the 62 years (Appendix 1). Of those, 34 are permanent residents, two are winter residents, 17 are summer residents, and one is a migratory species. Fifty-seven species (24% the 235 total) were seen on count day in five or fewer years. Of the 57 seen infrequently on Count Day, 13 are winter residents, four are summer residents, 11 represent species that migrate through our area, six are classified as rare, and the remaining 23 are considered accidental, or vagrant species, or have a dual designation status (e.g., Horned Grebe, WR).

Individual Birds: A total of 470,329 individual birds has been counted over the 62 count days with an annual average count of 7592 (SD = 1900) individual birds. The lowest number of individual birds counted, 4107, occurred on 2 May 1958. The highest number of birds recorded on a count day, 13,074 individual birds, occurred on 29 Apr 1967.

Participants' Effort: Party Hours and Miles: The annual average number of volunteers participating on count day was 31 (SD = 5.6). Only 18 birders participated on 2 May 1959; whereas, 48 birders participated on 6 May 1995, the largest number in any year. Party hours reflect the effort spent by groups of participants. The party hour average across the 62 years was 97.4 (SD = 15.1) hours. The fewest hours spent counting were 60 on 30 Apr 1983, and the most hours spent (144) occurred on 2 May 2009. The groups of birders also reported many miles traveled during the count, both on foot and while driving. The foot miles and driving miles were summed and designated as party miles. The number of party miles ranged from 164 on 30 Apr 1960 to 514 on 2 May 1992 with an annual average of 356 (SD = 67.4) miles

Relationship between Count Effort and Species and Individual Birds Observed: If the groups of participants report greater time spent and more miles traveled, does this greater effort result in a higher number of species and total number of birds counted?

As one might have expected, a significant relationship was found between the total number of species reported and the total number of individual birds counted (Pearson correlation = 0.72, p=0.01). The relationship between the total number of hours spent birding and the number of species observed also was significant (Pearson correlation = 0.44, p=0.05), as was the relationship between the number of miles travelled and the number of species observed (Pearson correlation = 0.41, p=0.05).

A significant relationship was found between the number of birds counted and the total number of hours spent counting birds (Pearson correlation = 0.55, p=0.05). That is, not surprisingly, more hours devoted to counting resulted in more birds being seen or heard. The relationship between the number of birds counted and the number of participants counting those birds also was significant (Pearson correlation = 0.55, p=0.05).

In combination these factors, i.e. species counted, party hours and party miles, accounted for about 50% of the variability in the numbers of individuals counted. Additional factors, including simple random variation, are likely contributing to variation in the number of species and number of birds seen during count day throughout the years.

A Longitudinal Perspective: Sixty-two years of SBC data enable examination of species and trends in the numbers of individual birds across the seven decades. Only two years of data were available in the 1950s; only eight years of data were available in the most recent decade. The total number of birds (abundance) for each species was summed across each decade. Each species received a ranking based on total number of birds counted in each decade. Appendix 2 presents the 21 species and their ranking in the "Top Ten" most abundant species in one or more decades.

Seventy-one percent (15 of 21 total) of the species are permanent residents in Guilford County.

Based on their rankings in all seven decades, three species are considered the most prevalent. These are the American Robin, European Starling and Northern Cardinal. The European Starling is the only species receiving a "Top Five" ranking across each decade of the 62-year count period. No other bird can claim such distinction. Given that this species was introduced in Central Park, New York in 1890 (Koeing 2016), the European Starling has demonstrated its ability to disperse and adapt to new habitats. The European Starling's peak abundance occurred in the 1970s and their numbers have declined in subsequent decades. The American Robin and Northern Cardinal also are abundant as indicated by their rankings across decades.

Other trends emerge in concert with changes in the landscape of Guilford County over the past 62 years. The Wood Thrush (Fig.1) and Bobolink were among the "Top Ten" most prevalent species in the 1950s and 1960s, respectively. However, as reflected by their rankings, declines in their abundance are evident by the 1970s. The Red-winged Blackbird and House Sparrow show similar trends, ranking in the "Top Ten" species in the early decades and subsequently falling in abundance and rankings.

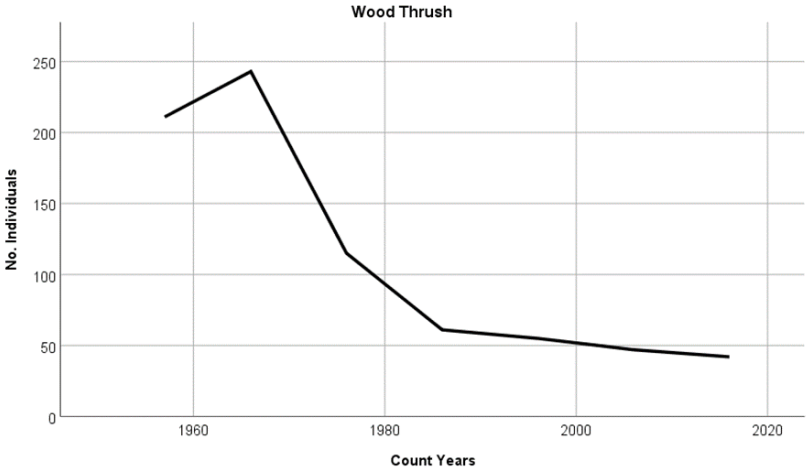

Figure 1. Representative species ranked in the Top Ten that showed a decline in the number of individuals counted over the 62 years. The vertical axis anchors the total number of individual birds counted. The horizontal axis represents years. N.B. All figures show variation on the y-axis due to scaling of the y-axis relative to the total number of birds seen for that species.

Species such as the Canada Goose (Fig. 2), Mallard, and Double-crested Cormorant that use open-water spaces have "Top Ten" rankings in one or more of the last three decades. The Canada Goose numbers rose rapidly, appearing among the "Top Ten" species in the 1990s and rising into the "Top Five" in abundance during the current and two previous decades. The abundance of Mallards peaked in the 1990s and has declined since then. The numbers of Double-crested Cormorants have increased in the current and last decade as evidenced by a "Top Ten" ranking in the current decade.

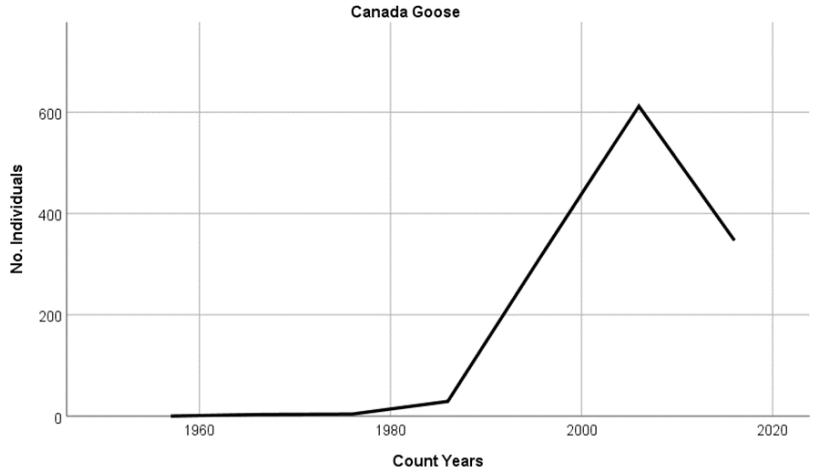

Figure 2. Canada Goose is a representative species ranked in the Top Ten that shows an overall increase in abundance through 2006. The vertical axis anchors the total number of individual birds counted. The horizontal axis represents years.

Species not in the "Top Ten" rankings also demonstrate increases or decreases in abundance across the count years. A representative species demonstrating an increase in abundance is the Brown-headed Nuthatch (Fig. 3); a decrease in abundance is noted for the Northern Bobwhite (Fig. 4).

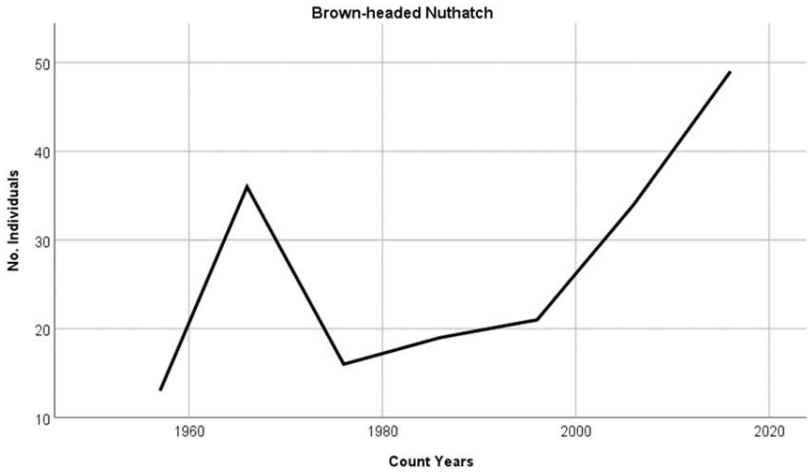

Figure 3. Apparent increase in Brown-headed Nuthatch numbers across the 62 years of the counts. The vertical axis anchors the total number of individual birds counted. The horizontal axis represents years

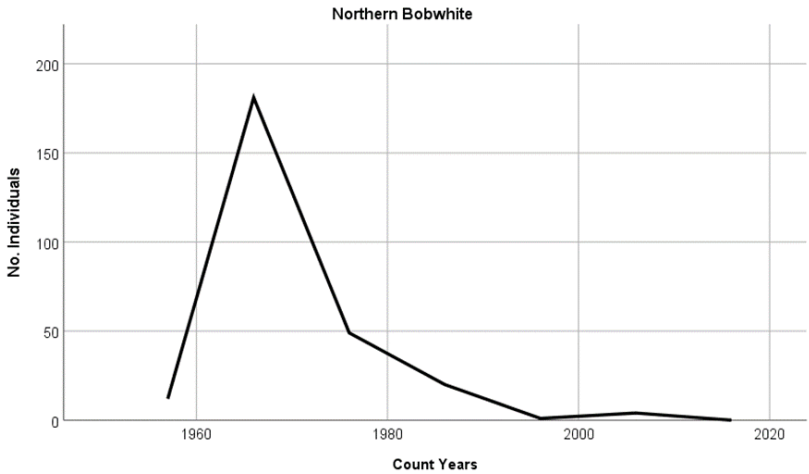

Figure 4. Representative species that showed a decline in the number of individuals counted over the 62 years. The vertical axis anchors the total number of individual birds counted. The horizontal axis represents years.

These findings provide a longitudinal perspective on the species recorded on SBC day. The remainder of the report speculates about possible reasons for fluctuations in the numbers of species seen, the numbers of

individuals observed for a species across the count years and subsequent ranking of a species in the "Top Ten.". These speculations are made cautiously.

Discussion

Possible Reasons for Observing or Not Observing A Species:

Count day numbers represent an annual snapshot of the species and abundance of individual birds found within the count circle. Many factors influence the number of species seen or heard in a single day, and these factors are interrelated and compounded across the 62-year count span. These factors include but are not limited to:

1. Human observers

A basic assumption is that all birders do their best to identify the birds in their count area. Factors that may influence an observer's count include the ability of birder to see, hear and identify the species. The birder's familiarity with the assigned territory and "knowing" the right place and time to find birds. Other possible factors include the consistency with which sites in the count circle are visited each year, the time available for the count given competing obligations, time available to conduct nocturnal counts, and possibly fatigue, as some birders may spend most of the day observing birds.

2. Weather conditions

Birders and birds encountered hot, cold and rainy conditions on count day. The average annual temperature on count days was a high of 73.4^0 F, and a low of 52.8^0 F. The hottest count day occurred on 29 Apr 2017 when the average temperature was 79 degrees. Despite the heat, 34 birders spent 98.3 hours birding and observed 121 species and 9038 individual birds. On 2 May 1964, the coldest count day, the average temperature was 50 degrees. On this day, the 30 birders spent 111.5 hours birding and saw 146 species and 10,961 individual birds. It is possible that some variation in both species numbers and numbers of individual birds could be related to temperature on count day.

The mean rainfall on count day is 0.07 inches. The 3 May 1997 count day was the rainiest (1.01 inches). The 36 participants spent 105.5 hours observing and reported 127 species and 7435 birds.

Although we expect birds to have sought shelter during these conditions, these dates do not correspond to the count day with the lowest number of birders (1959), lowest total species (1982) or lowest number of birds (1958). Weather conditions (high and low temperature, and precipitation) in Guilford County on count day did not appear to have a significant effect on birders, species, or number of birds counted.

Adverse or favorable weather conditions on count day as well as impending weather events here or in other areas may influence the arrival or departure of migratory species. For example, some species may have stayed later than anticipated, e.g., Northern Pintail and Green-winged Teal. Weather

conditions at the coast, may have influenced some species to drop into Guilford County, e.g., Great Cormorant and Anhinga.

3. Changes in habitat

Habitat changes have been reported to be both detrimental and beneficial to different bird species. As noted in the PBC publication, "The Birds of Guilford County, NC: Then and Now", Greensboro's steady increase in population has been supported by increased housing development as well as expansion of roads, industry, and the PTI Airport (Piedmont Bird Club 2017).

In 1958 (early in the count period under review) Lake Brandt was modified to raise the water to its current level and, two new lakes were built: Lake Townsend (1969) and two decades later Oak Hollow Reservoir (1972) (Piedmont Bird Club 2017). These changes have benefitted some species that use open water. The rise in abundance of the Double-crested Cormorant is attributed in part to an active roosting site on Lake Brandt. Open water access in addition to other resources (food, nesting sites) have afforded the Canada Goose with sufficient habitat resulting in a population explosion and the species becoming a permanent resident. The first two Canada Geese were reported in the 1965 Count; and, since 1981, a dramatic increase in numbers has been observed with the highest number of 612 individuals recorded in the 2006 Count (Fig. 2). The dip in the total number of Canada Geese counted is recent years is possibly due to multiple factors including Canada Goose abatement efforts (Romano 2018).

Declines in open fields and grasslands as well as changes in farming practices may contribute to the declines in ground nesters such as the Northern Bobwhite, Eastern Whip-poor-will, Horned Lark, as well as other species that rely on this habitat, e.g. Bobolink, and Red-winged Blackbird. An interesting observation is the Northern Bobwhite's spike in numbers occurring between 1962 and 1974 with a peak count of 181 individual birds in 1966 (Fig. 4). Perhaps the spike represents a new count site within the count circle or an increase in the population of Northern Bobwhites during that time period. Prior to and following this spike, the number of birds counted was generally under 50. Since 1998, only 28 birds have been counted, and in nine of the last 21 years no Northern Bobwhite has been reported on the SBC. The Horned Lark is another species not reported on the SBC since 1999.

Data on the total acreage of agrarian lands lost in Guilford County and the count circle are difficult to obtain. As noted previously, most of the PTI Airport lies in the count circle. Expansion of the airport reduced the grassland and woodland habitat available in the count circle. Notable trends in land use include amalgamation of smaller farms into larger parcels (USDA Agricultural Statistics Service 2017). This trend might result in less diverse plant species to support avian populations, particularly the grassland species. Open spaces are being purchased by conservancies and other groups

(Guilford County Open Space Preserves 2017) and farm land is being sold for development. In 2017, Guilford County Open Space Preserves had 14 sites consisting of a total of just 1727 acres, less than half the size of the Piedmont Triad airport (3770 acres).

Forested land is a haven for the cavity-nesting species including Owls, Woodpeckers, Swallows, Purple Martins, and many song birds. The Wild Turkey lives in mature forests and relies on both open fields and edges of forests for foraging. This species has been seen during 17 of 62 count years, making it difficult to assess loss of habitat and abundance of the species. A reduction in forested lands may, in part, explain the reduction in individuals of some woodland species, for example, the Wood Thrush (Fig. 1).

The U.S. Forestry Service (2017) survey of selected plots of land in Guilford County shows an increase in Virginia pine which is good news for the Brown-headed Nuthatch (Fig. 3). Since the 1980s, a steady increase has occurred in the number of Brown-headed Nuthatches counted.

4. Birds themselves

Many factors contribute to why a species or number of individual birds are seen on count day. Birds may be actively moving about or sheltered and not visible to the counters. Or, birds may just be outside the count perimeter and thus cannot be counted. Timing (arrival and departure) of migrating species can vary slightly and affect counts. The complexity of such fluctuations in species observed and particularly in bird populations is a rich area for research (Koenig 2016). Fluctuating increases or decreases in species and numbers of individual birds counted across the years may also represent normal variation in the bird population; or in the relationship between abundance and availability of resources (nest sites, food); or in the observational process itself.

Sufficient numbers of nesting sites within the count circle may facilitate the maintenance or increase in abundance of birds, thereby increasing the chances of a birder observing the bird on count day. Abundance of food supply could influence the arrival or departure of migratory species. Additionally, the loss of foraging sites could result in movement of the species to different foraging sites within or outside the count circle and potentially reduce the chances of that species being observed.

Additionally, parasites, pathogens and use of pesticides could affect individual birds as well as the entire population of a species or many species (Koenig 2016). Over time these potentially detrimental effects could be reflected by decreased numbers observed during subsequent count years.

The population of birds is and will continue to be influenced by two driving forces, climate change and landscape change. In the past century, climate changes (temperature, precipitation and sea level) have accelerated and are a threat to bird populations. As warming occurs there is a greater mismatch between nesting and breeding behavior and maximum availability

of food resources to raise young. The National Audubon Society Report (2015) documents more than half of the birds in North America as climate threatened or climate endangered. Those species of birds that are unable to rapidly adapt may face an accelerated march toward extinction.

The continued change in landscape due to Greensboro's population growth is and will be another driving force affecting bird populations. Currently, the last three segments of the Greensboro Urban Loop have just been completed or will be completed by 2021. The projected preferred routes for these segments are approximately 37.5 miles long and consume approximately 1775 acres. According to the N. C. Department of Transportation Project Environmental Studies Report (2018), these acres include bird habitat, i.e., cultivated fields, woodlands, wetland habitats, open water venues, floodplains, as well as stream crossings. Approximately 4000 feet of streams will be relocated. Much of the pending loss in bird habitat is located within the count circle.

Summary

This 1957 to 2018 span represents one of the longest consecutive SBCs for any count circle in North Carolina. Many individuals have participated in the SBCs in Guilford County, and the number of participants and the number of hours they spent while counting birds are significantly related to the total number of birds tallied on count day.

The SBC provides some insight into the complexity of human-bird interaction and the complexity of bird behavior, and their population changes and distribution. Thus, factors in addition to the time spent 'in the field' on count day influence the number of individual birds counted each year. Some species have increased in abundance over the years. Perhaps these species are more opportunistic or better able to adapt to the changes in Guilford County's habitat; or they have benefitted from man-made bird friendly environments, i.e., nesting sites and feeding stations. Other species have declined, due in part to the changes in habitat. Conservation strategies including preservation of open spaces and retention of forested and agrarian areas may benefit all species of birds in the County. As the SBCs continue, more definitive trends regarding apparent increases and decreases in the populations of species may emerge, particularly in the face of climate change and the expansion of infrastructure to meet the demands of a growing Greensboro population.

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Appendices

Editor's Note: In the past *The Chat* endeavored to provide in printed format numerical or statistical data provided by various authors. In some cases the associated appendices or tables constituted a not insignificant portion of the particular periodical in which they were presented.

Feedback from readers suggests that making this information accessible while not resorting to page upon page of graphs or tables might be an opportunity. Now that *The Chat* has fully embraced digital publishing, we have the ability to provide ancillary data in ways that may make it more usable to the interested reader, while maintaining a cleaner look across the publication. To this end, I am experimenting with embedding tables and charts as links within the native PDF format of *The Chat*. To access these appenndices, generally also provided in PDF format, simply click on the embedded documents. In this case of this article, **Appendix 1** and **Appendix 2** are provided in this format. Please give it a try!

We continue to try and incorporate feedback from readers in the final product, so both positive and constructive comments are appreciated.

To view Appendix 1, click here:

To view Appendix 2, click here: