



# Bird Monitoring at Homestead National Historical Park, Nebraska

*Status Report 2009–2022*



Prairie at Homestead National Historical Park.  
NPS/HEARTLAND NETWORK

# **Bird monitoring at Homestead National Historical Park, Nebraska: Status report 2009–2022**

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# Contents

|                          | Page |
|--------------------------|------|
| Figures.....             | iv   |
| Tables.....              | v    |
| Appendices.....          | vi   |
| Abstract.....            | vii  |
| Acknowledgments.....     | viii |
| Introduction.....        | 1    |
| Methods.....             | 3    |
| Site Selection .....     | 3    |
| Bird Surveys .....       | 4    |
| Habitat Assessment ..... | 5    |
| Data Analysis .....      | 5    |
| Results.....             | 9    |
| Bird Surveys .....       | 9    |
| Habitat Assessment ..... | 15   |
| Discussion.....          | 16   |
| Literature Cited .....   | 18   |

# Figures

|                                                                                                                                                                                                                                                                      | Page |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Figure 1.</b> Location of Homestead National Historical Park (HOME), Nebraska, within the Central Mixed Grass Prairie Bird Conservation Region.....                                                                                                               | 1    |
| <b>Figure 2.</b> Bird plot locations on Homestead National Historical Park (HOME), Nebraska. ....                                                                                                                                                                    | 3    |
| <b>Figure 3.</b> Comparison of bird population trends from Homestead National Historical Park (HOME), Nebraska (2009–2022), with those of the larger Central Mixed Grass Prairie Bird Conservation Region (2009–2019) from the USGS Breeding Bird Survey (BBS). .... | 13   |
| <b>Figure 4.</b> Trends in bird community diversity, richness, and species distribution evenness on Homestead National Historical Park, Nebraska, from 2009 through 2022.....                                                                                        | 14   |

# Tables

|                                                                                                                                                                                                                                                                                                                                                                         | Page |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Table 1.</b> Number of plots sampled and sampling dates for breeding bird surveys conducted at Homestead National Historical Park, Nebraska, by year.....                                                                                                                                                                                                            | 4    |
| <b>Table 2.</b> Bird species recorded during breeding bird surveys at Homestead National Historical Park, Nebraska, 2009–2022. ....                                                                                                                                                                                                                                     | 9    |
| <b>Table 3.</b> Plots sampled on Homestead National Historical Park, Nebraska, between 2009 and 2022 and gross habitat type. ....                                                                                                                                                                                                                                       | 20   |
| <b>Table 4.</b> Annual proportion of plots occupied by and estimated abundance (determined using Distance software) of breeding bird species at Homestead National Historical Park, Nebraska, during the 2009–2022 spring bird surveys (n = number of plots sampled). ....                                                                                              | 23   |
| <b>Table 5.</b> Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). ....                                                          | 25   |
| <b>Table 6.</b> Trends, annual change in abundance (individuals), of breeding birds recorded on Homestead National Historical Park, Nebraska, from 2009 through 2022.....                                                                                                                                                                                               | 31   |
| <b>Table 7.</b> Regional trends (Central Mixed Grass Prairie Bird Conservation Region) in breeding birds recorded on Homestead National Historical Park, Nebraska, from 2009 through 2019. ....                                                                                                                                                                         | 32   |
| <b>Table 8.</b> Average percent cover ( $\pm$ standard deviation) of each habitat type in 50 m plots at Homestead National Historical Park, Nebraska, during the bird breeding seasons from 2009 to 2022 (n = number of plots samples). ....                                                                                                                            | 35   |
| <b>Table 9.</b> Average ( $\pm$ standard deviation) canopy cover, canopy height, basal area, percent cover of vegetation at various horizontal height increments to 2.0 m, and vertical structural diversity in 5 m subplots at Homestead National Historical Park, Nebraska, during the bird breeding seasons from 2009 to 2022 (n = number of subplots samples). .... | 36   |
| <b>Table 10.</b> Average percent ( $\pm$ standard deviation) of soil substrate cover and plant guild cover in 1.78 m sample plots at Homestead National Historical Park, Nebraska, during the bird breeding seasons from 2008 to 2021 (n = number of subplots sampled). ....                                                                                            | 37   |
| <b>Table 11.</b> Stems per hectare for trees found at Homestead National Historical Park, Nebraska, by size class, during the 2009 to 2022 bird breeding seasons (n = number of plots sampled). ....                                                                                                                                                                    | 38   |

# Appendices

|                                                                                                            | Page |
|------------------------------------------------------------------------------------------------------------|------|
| Appendix A. Plots Sampled.....                                                                             | 20   |
| Appendix B. Proportion of Plots Occupied and Abundance (Corrected for Undetected<br>Individuals) .....     | 23   |
| Appendix C. Proportion of Plots Occupied and Abundance (Not Corrected for<br>Undetected Individuals) ..... | 25   |
| Appendix D. Homestead National Historical Park Trends .....                                                | 31   |
| Appendix E. Regional Trends .....                                                                          | 32   |
| Appendix F. Habitat Parameters .....                                                                       | 35   |

## Abstract

In 2009, the Heartland Inventory and Monitoring Network initiated bird surveys on Homestead National Historical Park to monitor changes in bird community composition and abundance and improve our understanding of relationships between breeding birds and their habitat and the effects of management actions on those relationships. This information helps park staff plan management objectives and assess the effectiveness of management alternatives. We evaluated park breeding bird trends in the context of trends observed within the North American Bird Conservation Initiative's Central Mixed Grass Prairie Bird Conservation Region where the park is located. This allows us to assess the influence of park habitat management on bird populations with an understanding of regional population trends that are outside the influence of natural resource management activities at the park.

Ninety-eight species of birds were recorded on the park in 14 years (2009–2022). Eighty-one of the species are considered breeding species (permanent or summer residents). Two of these are species of concern for the Central Mixed Grass Prairie Bird Conservation Region. Eighteen species were observed in sufficient numbers to calculate annual abundances and trends with some degree of statistical confidence. The Dickcissel, Red-winged Blackbird, House Wren, and Common Yellowthroat were the most abundant and widespread species on the park. Comparisons of regional trends (2009–2019; Sauer et al. 2020) with park population trends were inconclusive. Red-winged Blackbird had a moderately increasing park population, but trends of the other 17 abundant species on the park were uncertain. Regionally, the Gray Catbird and Yellow Warbler were increasing, the Brown-headed Cowbird, Common Yellowthroat, Mourning Dove, Northern Bobwhite, Ring-necked Pheasant, and Red-winged Blackbird were declining, and the remaining 10 species had uncertain population trends. Diversity, richness, and evenness in distribution of individuals across species in the park breeding bird community were unchanged over the 14 years.

When sampled, habitats on the plots at Homestead National Historical Park consisted primarily of the field/prairie and woodland vegetation types, with lesser amounts of other types present. Canopy cover of hardwood trees averaged 18 to 33% on plots, basal area averaged 7 to 10 m<sup>2</sup>/ha, and canopy height averaged 7 to 10 m. Tree species from 10 different families contributed to the canopy cover and basal area of plots. Plots sampled were primarily unvegetated at ground level, with grass litter common and bare soil exposed. Total foliar cover at ground level on plots consisted primarily of cool season grasses and forbs.

## **Acknowledgments**

We would like to thank the staff of Homestead National Historical Park, Nebraska, for allowing us access to the park during our site visit. We would also like to thank park staff and volunteers who assisted with bird surveys on the park: Jesse M. Bolli, Gordon Grover, Sarah E. Rehme, Kellie L. DeJong, Shin-Ping C. Lao, Kelly A. Manktelow, Chelsea N. Schrage, Brittani Salvatore, Miles W. Lampo, Marty J. Tuttle, Marshal L. Tuttle, and Jorge Vargas-Barriga.

# Introduction

Birds are an important component of park ecosystems. Their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems. It has been suggested that management activities aimed at preserving habitat for bird populations (e.g., habitat for neotropical migrants) can have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991; Maurer 1993). Birds also have a tremendous following among the public, and many parks provide information on the status and trends of birds through their interpretive programs.

Homestead National Historical Park, Nebraska, is in the northeast section of the Central Mixed Grass Prairie Bird Conservation Region (Figure 1), one of 67 bird conservation regions identified in the North American Bird Conservation Initiative (NABCI). Started in 1999, the NABCI is a coalition of government agencies and private organizations in the United States working to ensure the long-term health of North America's native bird populations (NABCI 2024).

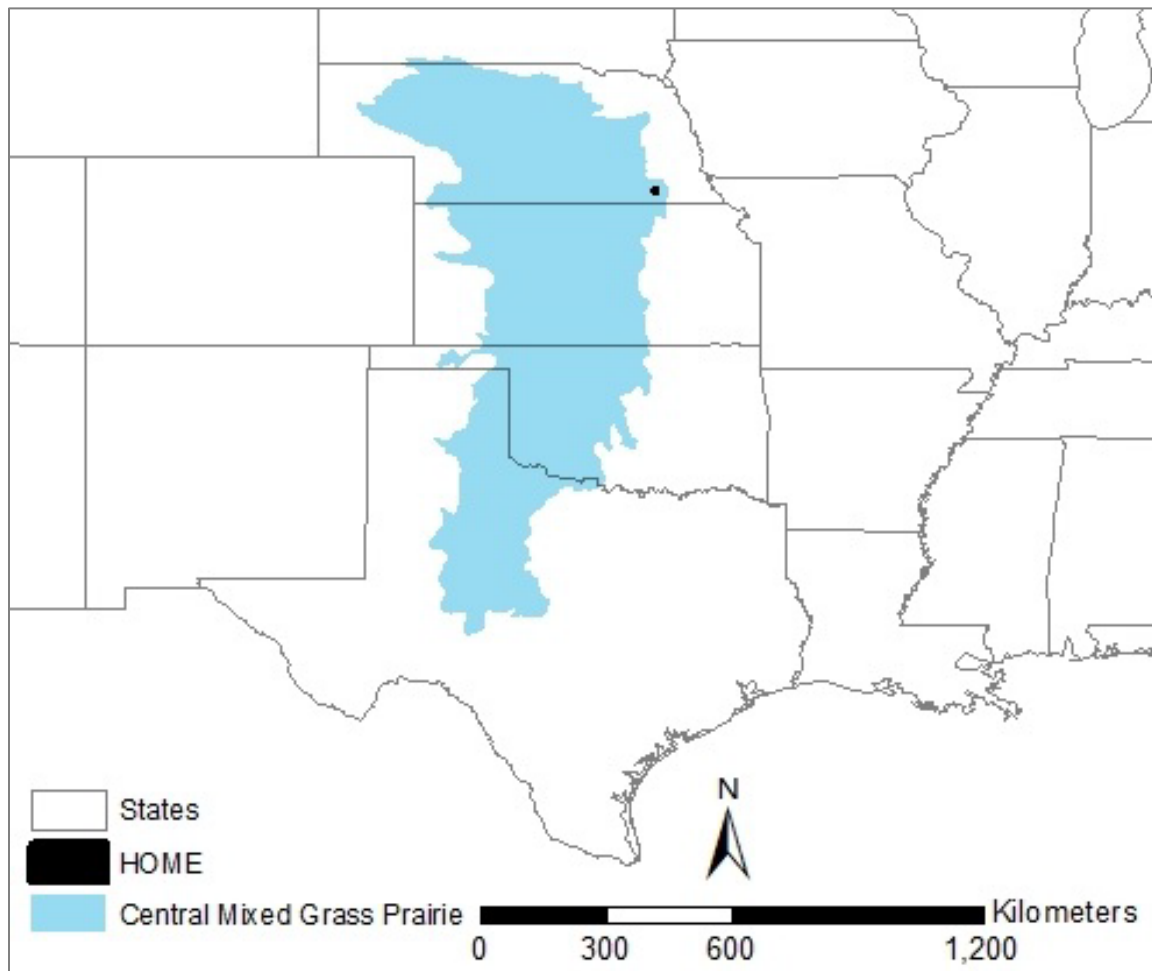


**Figure 1.** Location of Homestead National Historical Park (HOME), Nebraska, within the Central Mixed Grass Prairie Bird Conservation Region.

The Central Mixed Grass Prairie extends from the edge of shortgrass prairie on its west side to the beginning of the tallgrass prairie and savanna-like habitat on its east side (NABCI 2024). Large areas in the center of this region have been converted to agriculture. However, extensive areas of high-quality grassland remain in the Nebraska Sandhills and the shrublands in Texas. Approximately 130 species of breeding birds can be found in the mixed grass prairie habitat of the area around Homestead National Historical Park (Sharpe et al. 2001).

Data collected during the U.S. Geological Survey's (USGS) annual North American Breeding Bird Surveys (BBS) between 2009 and 2019 indicate that 20 potential breeding species occurring at Homestead National Historical Park show evidence of population decline (Sauer et al. 2020). In fact, 15% of the species in the Central Mixed Grass Prairie Bird Conservation Region that breed or have some potential to breed on the park have populations reported to be in decline, with species such as the Tree Swallow (*Tachycineta bicolor*), Great-tailed Grackle (*Quiscalus mexicanus*), Loggerhead Shrike (*Lanius ludovicianus*), and Grasshopper Sparrow (*Ammodramus savannarum*) declining at alarming rates.

Long-term trends in community composition and abundance of breeding bird populations provide one measure for assessing the ecological integrity and sustainability of this system. We use trends in the composition and abundance of bird populations as long-term indicators of ecosystem integrity in bird habitat found at Homestead National Historical Park. *Ecosystem integrity* is defined as the system's capability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats of the region. Research has demonstrated that birds serve as good indicators of changes in ecosystems (Cairns et al. 1993; Mallory et al. 2006; Wood et al. 2006). Therefore, changes in the number of individuals and species composition of bird communities may reflect the effectiveness of management actions implemented to restore and maintain bird habitat at Homestead National Historical Park.

There are two primary objectives for monitoring breeding birds at Homestead National Historical Park:

- Identify significant temporal changes in the species composition and abundance of bird communities that occur at the park during the breeding season.
- Improve our understanding of relationships between breeding birds and habitat and the effects of management actions (such as prairie restorations or prescribed fire) on bird populations by examining potential correlations between changes in specific habitat variables (e.g., vegetation structure, ground cover) and changes in bird community composition and abundance.

This report summarizes species composition and population trends for birds recorded during 14 years (2009–2022) of monitoring.

# Methods

## Site Selection

Permanent monitoring locations or “plots” were selected by overlaying a systematic grid of 100 x 100 m cells (originating from a random start point) across Homestead National Historical Park. The orientation of the grid was rotated 45 degrees to prevent monitoring sites from being influenced by man-made features (roads, fences, etc.) located along cardinal directions. We established 48 permanent plots (Figure 2), 18 in woodland habitat and 30 in grassland/open habitat (Appendix A). However, due to various reasons (i.e., several plots falling in Cub Creek and volunteer availability) the number of plots sampled annually ranged from eight to 47 (Table 1).

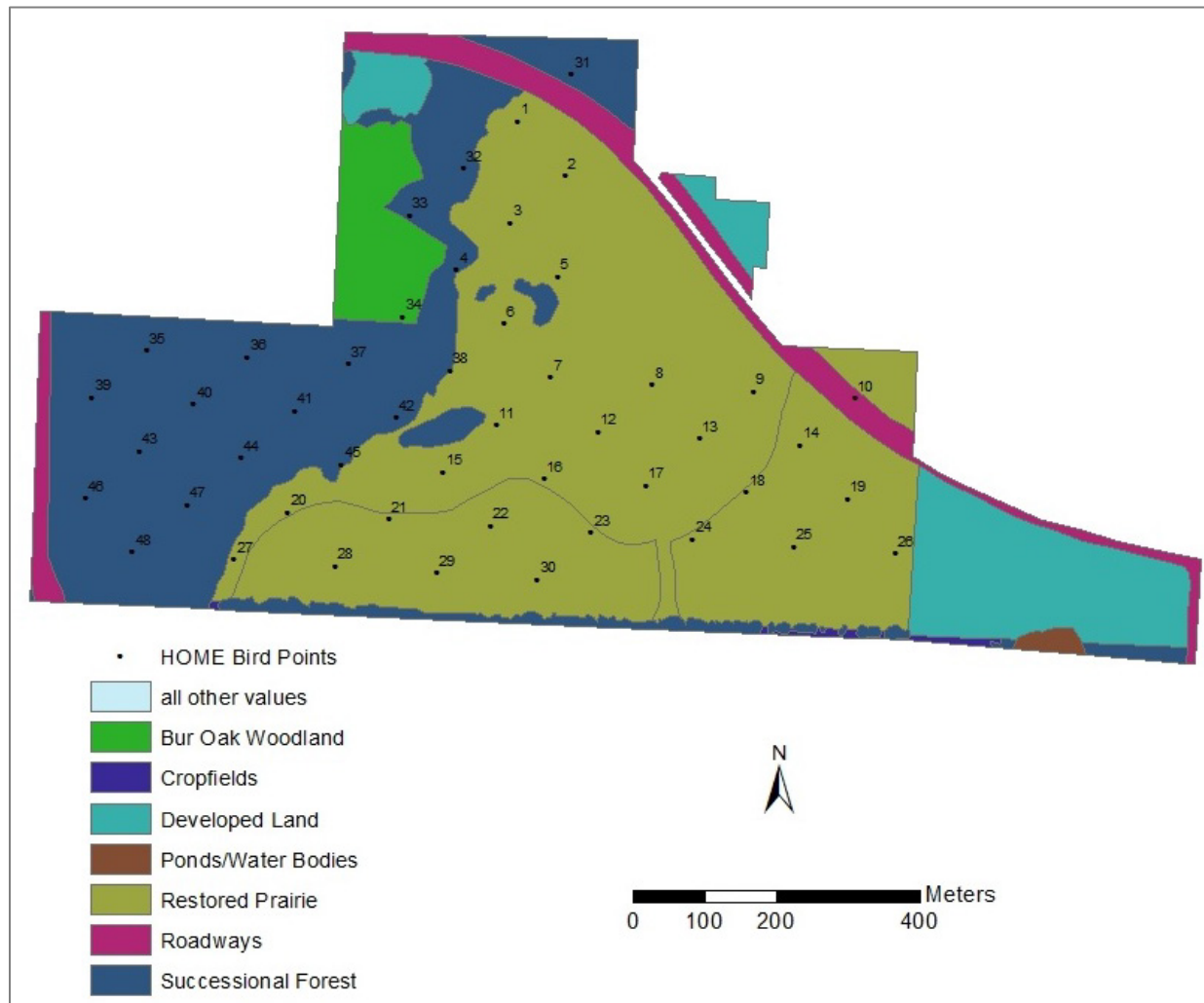


**Figure 2.** Bird plot locations on Homestead National Historical Park (HOME), Nebraska. Vegetation mapping and classification provided by Kindscher et al. (2011).

**Table 1.** Number of plots sampled and sampling dates for breeding bird surveys conducted at Homestead National Historical Park, Nebraska, by year. Also listed are observer(s) who conducted the surveys and whether habitat data were collected during the survey year.

| Year | Sampling Dates  | Number of Plots Sampled | Observer(s)                                                           | Habitat Data Collected |
|------|-----------------|-------------------------|-----------------------------------------------------------------------|------------------------|
| 2009 | May 12–May 13   | 44                      | D. G. Peitz <sup>A</sup>                                              | Yes                    |
| 2010 | May 18–June 5   | 47                      | J. M. Bolli, G. Grover, and S. E. Rehme                               | No                     |
| 2011 | June 2–June 16  | 42                      | J. M. Bolli, K. L. DeJong, and S. C. Lao                              | No                     |
| 2012 | June 5–June 15  | 43                      | J. M. Bolli, K. A. Manktelow, and C. N. Schrage                       | No                     |
| 2013 | May 14–May 14   | 9                       | J. M. Bolli and D. G. Peitz <sup>A</sup>                              | Yes                    |
| 2014 | May 31–May 31   | 9                       | J. M. Bolli                                                           | No                     |
| 2015 | June 10–June 10 | 9                       | J. M. Bolli and B. Salvatore                                          | No                     |
| 2016 | June 10–June 10 | 8                       | J. M. Bolli and M. W. Lampo                                           | No                     |
| 2017 | May 16–May 17   | 44                      | D. G. Peitz <sup>A</sup> and D. W. Marcum <sup>A</sup>                | Yes                    |
| 2018 | May 16          | 9                       | J. M. Bolli and J. B. Grey                                            | No                     |
| 2019 | May 31          | 9                       | J. M. Bolli, M. J. Tuttle, and M. L. Tuttle                           | No                     |
| 2020 | May 27          | 9                       | J. M. Bolli and M. J. Tuttle                                          | No                     |
| 2021 | June 2–June 3   | 19                      | J. M. Bolli, M. J. Tuttle, M. L. Tuttle, and J. Vargas-Barriga        | No                     |
| 2022 | May 12–May 13   | 44                      | D. G. Peitz, <sup>A</sup> D. W. Marcum, <sup>A</sup> and M. J. Tuttle | Yes                    |

<sup>A</sup> Heartland Inventory and Monitoring Network staff.

During bird surveys in 2009, monitoring plots were located using navigation waypoints (Peitz 2010) in a Trimble Geo XT GNSS unit and temporarily marked with 36-inch pin flags to aid in relocating the plots for habitat assessment, eliminating the need for permanent plot markers. We collected pin flags from each plot once the habitat work was completed. In 2013, 2017, and 2022 the habitat assessment crews worked independent of the bird surveyor, and monitoring plots were located using a GNSS unit and not marked with pin flags. During bird surveys in 2010 to 2012, 2014 to 2016, and 2018 to 2021, years when habitat assessments were not conducted, monitoring plots were located using a GNSS unit and plots were not marked with pin flags.

## Bird Surveys

Bird surveys followed methods outlined in the bird monitoring protocol by Peitz et al. (2008) and summarized in this report. Variable circular plot counts, a point count methodology that incorporates a measure of detectability into population estimates, were used to survey birds present (Fancy 1997). All birds seen or heard at plots during 5-minute sampling periods were recorded along with their corresponding distance from the observer. For most species, we recorded each individual bird as a separate observation. For species that usually occur in clusters or flocks, the units recorded were cluster or flock size, and not the individual bird. During analysis, each individual in a cluster or flock was treated as a separate observation. After completing a count at a plot and filling out the data sheet, the observer navigated to the next plot using a GNSS unit. While traveling between plots, the

observer was vigilant for the presence of species not recorded during timed surveys. These observations help formulate a more complete species list for the park by identifying species missed during timed surveys. However, these observations were not included in any analysis as they did not directly relate to any individual plot. We sampled birds in the morning from the time it was light enough to observe birds to four hours after sunrise.

Variable circular plot counts were conducted to get an “instantaneous count” of all birds present. The observer recorded birds flushed from a plot when approached and the counts started as soon as the observer reached plot center. We recorded all birds seen or heard, including flyovers, along with distance from the observer when possible. For this report, all birds seen or heard during the 5-minute survey are included.

### **Habitat Assessment**

The collection of habitat data followed methods outlined in the bird monitoring protocol by Peitz et al. (2008) and summarized in this report. Habitat data were collected in 2009, 2013, 2017, and 2022. During years when habitat assessments occurred, plots were visited in generally the same order they were surveyed for birds to avoid disturbing birds on a plot prior to sampling. Once the habitat crew arrived at a plot, they set up a 5 m radius subplot and completed all habitat measures for this subplot, a nested 1.78 m radius sample plot, and a larger 50 m radius plot.

Slope, slope variability, aspect, aspect variability, and topographic position of each 50 m radius plot were recorded during the first visit to a plot and not remeasured in subsequent years. Amounts of vegetation (of various types: drainage, old field/prairie, shrub, and woodland), road, and water cover on each 50 m plot were recorded. As 5 m subplots were sampled, horizontal vegetation cover was estimated in 0.25 m intervals from 0.0 to 2.0 m above ground surface using a 0.15 m wide cover board. Area of the cover board obscured by vegetation was estimated at a location 15 m north of plot center. Using a graduated measuring rod, vertical vegetation structure was measured in 1 m increments up to 7.5 m in height at four locations around the perimeter of the subplot. Locations were in the four cardinal directions. Vertical structure was recorded for deciduous, coniferous, and herbaceous vegetation. Trees were tallied by species and diameter size class (<1.0 cm, 1.1–2.5 cm, 2.6–8.0 cm, 8.1–15.0 cm, 15.1–23.0 cm, 23.1–38.0 or >38.0 cm) on subplots. Lastly, at a 1.78-m sample plot nested within the subplot, ground and foliar cover were estimated. Ground cover classes included deciduous and grass litter, bare soil, rock, woody debris (>2.5 cm diameter), and unvegetated. Foliar cover was estimated for six plant guilds, including warm-season and cool-season grasses, forbs, mosses and lichens, shrubs and vines, tree seedlings, and total foliar cover (<1.5 m tall).

### **Data Analysis**

Prior to summary analysis, the residency status (migrant, permanent resident, summer resident, transient, and winter resident) was determined for each bird species detected. Identifying the residency of each species helps to exclude migrants, transients, and winter residents from analyses of breeding birds within Homestead National Historical Park. Proportion of plots occupied by each bird species was calculated (total number of plots occupied by a species/plots surveyed) and reported in Appendices B and C.

For species with greater than 60 observations (18 species), Distance software (Distance 6.0 Release 2) was used to determine the park-wide abundance of each (Buckland et al. 2001). A central part of the analysis in Distance is the modeling of a detection function to account for individuals present but not observed, before calculating species abundance. Four candidate functions plus series expansion were considered in determining the detection function of each species (half-normal + cosine, uniform + cosine, half-normal + hermite polynomial, and hazard-rate + simple polynomial). The most robust models were selected by Distance based on the lowest Akaike Information Criteria (AIC) values.

The hazard-rate function without an adjustment term was selected for 11 species: American Robin (*Turdus migratorius*), Blue Jay (*Cyanocitta cristata*), Dickcissel (*Spiza americana*), Common Yellowthroat (*Geothlypis trichas*), Gray Catbird (*Dumetella carolinensis*), House Wren (*Troglodytes aedon*), Mourning Dove (*Zenaida macroura*), Northern Bobwhite (*Colinus virginianus*), Northern Cardinal (*Cardinalis cardinalis*), Red-bellied Woodpecker (*Melanerpes carolinus*), and Ring-necked Pheasant (*Phasianus colchicus*). The hazard-rate + simple polynomial function was selected for four species: American Goldfinch (*Spinus tristis*), Baltimore Oriole (*Icterus galbula*), Brown-headed Cowbird (*Molothrus ater*), and Red-winged Blackbird. Half-normal function without an adjustment term was selected for American Crow (*Corvus brachyrhynchos*). The half-normal + cosine function was selected for Yellow Warbler (*Setophaga petechia*), and the half-normal + hermite polynomial function was selected for Rose-breasted Grosbeak (*Pheucticus ludovicianus*). Abundances for these species are reported in Appendix B.

For species with fewer than 60 observations, park-wide abundance was calculated by first deriving a species density from observations recorded within a 50 m radius (0.79 ha) around each plot center and then calculating abundance based on average plot densities. Park-wide abundances for species with less than 60 observations are reported in Appendix C.

For species with adequate abundance (those with greater than 60 observations), trends were calculated by regressing abundance against survey years in the statistical package “rtrim” (built under R version 3.6.3) and reported in Appendix D. Rtrim is the R version of the statistical software package “TRIM,” a program developed for the analysis of count data obtained from wildlife population monitoring (Pannekoek and van Strien 2005). It analyzes time series of counts using Poisson regression and produces estimates of yearly indices and trends. We employed a linear trend model with changepoints selected by a stepwise procedure. Serial correlation in count data among years and overdispersion are accounted for with this software. Although TRIM has the capacity to estimate missing data, we restricted our regression analysis to nine plots that were surveyed in most years (Appendix A). By doing this we analyzed a consistent ratio of woodland and grassland/open plots across years.

For this report we also obtained regional breeding bird trends for the Central Mixed Grass Prairie Bird Conservation Area during the period from 2009 to 2019 from the Breeding Bird Survey (BBS) website of the USGS Patuxent Wildlife Research Center (Appendix E; Sauer et al. 2020). It is possible to determine trends for many bird species and many regions of interest for periods ranging from 1966 to 2019 by using the interactive calculator available at the [BBS Regional Trend Analysis Form website](https://www.pwrc.usgs.gov/bbs/trend/tf15.html) (https://www.pwrc.usgs.gov/bbs/trend/tf15.html). However, we chose the last 11-year

period of available data to maximize the accuracy of regional trend results at Homestead National Historical Park. We compared regional trends with those from the park calculated using TRIM. Regional trends with a confidence interval that straddled zero were classified as uncertain for comparison with results from the park. It should be noted that trends determined by the BBS were calculated using a different methodology; due to limitations in the BBS field data collections, hierarchical modeling was used to produce an annual index of abundance, and trends were then estimated as constant annual rates based only on the first and last years of the intervals selected. Since all but the first and last year indices are ignored in this approach, trends based on BBS data tend to display variability when compared among different broadly overlapping intervals, and caution should be used when interpreting BBS results.

Trends in the diversity, richness, and species distribution evenness of the breeding bird community on the park were assessed by regressing each metric against survey years in the add-in statistical software of Microsoft Excel and graphing the results. Prior to trend analysis, bird community diversity values were calculated annually using the Shannon Diversity Index ( $H'$ ):

$$H' = -\sum_{i=1}^s \left( \frac{n_i}{N} \right) \cdot \ln \left( \frac{n_i}{N} \right)$$

Where  $n_i/N$  is the proportion of the total number of individuals in a community consisting of the  $i$ th species (Shannon 1949). Species richness values were determined as the total number of bird taxa recorded annually. Species distribution evenness values were calculated using Pielou's evenness index ( $J'$ ):

$$J' = \frac{H'}{H_{max}}$$

where  $H'$  is the Shannon Diversity Index and  $H_{max}$  is the maximum possible diversity for a given number of species if all species are present in equal numbers ( $\ln(\text{annual species richness})$ ).  $J'$  is a measure of how evenly individuals are distributed within a community when compared to the equal distribution and maximum diversity a community can have (Pielou 1969).

Location and permanent abiotic measures on each plot were reported by Peitz (2010). Annual averages ( $\pm$ std dev) for semi-permanent plot data, including road and water cover, were calculated from plot estimates (Appendix F). Averages ( $\pm$ std dev) for horizontal vegetation cover at each of the vegetation profile heights between 0–0.25 m, 0.25–0.50 m, 0.50–0.75 m, 0.75–1.00 m, 1.00–1.25 m, 1.25–1.50 m, 1.50–1.75 m, and 1.75–2.00 m were calculated and reported. Average ( $\pm$ std dev) annual vertical structural diversity was estimated and reported as well. Vertical structural diversity was calculated as follows:

$$\text{Structural Diversity Index} = \frac{\left( \left( \sum_{i=1}^8 \frac{p_i}{8} \right) + a \right) \cdot 100}{2}$$

where  $p_i$  is the observed frequency for vegetation in the  $i$ th interval touching a measuring rod out of twelve measuring events, and  $a$  is the percent of intervals with recorded vegetation in eight height increments. Vertical structural diversity values are weighted equally to represent both the vertical height of vegetation and how dense the vegetation is within each height increment.

Within each plot, ground cover, including deciduous and grass litter, bare soil, rock, woody debris (>2.5 cm DBH), and unvegetated, were averaged ( $\pm$ std dev) across plots and reported (Appendix F). Foliar cover, by guild of warm-season and cool-season grasses, forbs, mosses and lichens, shrubs and vines, tree seedlings, and total foliar cover (<1.5 m tall), were averaged ( $\pm$ std dev) across plots as well (Appendix F). Trees were identified to family and size class before summing stems per hectare for the park (Appendix F).

# Results

## Bird Surveys

Between 2009 and 2022, 345 cumulative plots were surveyed. A total of 98 different bird species have been recorded, 81 of which are species with the potential to breed within Homestead National Historical Park (Table 2; Sharpe et al. 2001). Four breeding species were only observed outside 5-minute survey periods: American Woodcock (*Scolopax minor*), Common Nighthawk (*Chordeiles minor*), Northern Shoveler (*Anas clypeata*), and Savannah Sparrow (*Passerculus sandwichensis*). Two of the breeding species recorded, Bell's Vireo (*Vireo bellii*) and Red-headed Woodpecker (*Melanerpes erythrocephalus*), are considered species of regional concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008).

**Table 2.** Bird species recorded during breeding bird surveys at Homestead National Historical Park, Nebraska, 2009–2022. The American Ornithologists' Union code (AOU code) and residency status of each species is given. Species names are valid and verified names taken from the Integrated Taxonomic Information System web site (ITIS 2023).

| Common Name                      | Scientific Name              | AOU Code    | Residency <sup>A</sup> |
|----------------------------------|------------------------------|-------------|------------------------|
| American Crow                    | <i>Corvus brachyrhynchos</i> | AMCR        | R                      |
| American Goldfinch               | <i>Spinus tristis</i>        | AMGO        | R                      |
| American Redstart                | <i>Setophaga ruticilla</i>   | AMRE        | SR                     |
| American Robin                   | <i>Turdus migratorius</i>    | AMRO        | R                      |
| American Woodcock <sup>C</sup>   | <i>Scolopax minor</i>        | AMWO        | SR                     |
| Baltimore Oriole                 | <i>Icterus galbula</i>       | BAOR        | SR                     |
| Bank Swallow                     | <i>Riparia riparia</i>       | BANS        | SR                     |
| Barn Swallow                     | <i>Hirundo rustica</i>       | BARS        | SR                     |
| Barred Owl                       | <i>Strix varia</i>           | BADO        | R                      |
| <b>Bell's Vireo <sup>B</sup></b> | <b><i>Vireo bellii</i></b>   | <b>BEVI</b> | <b>SR</b>              |
| Belted Kingfisher                | <i>Megasceryle alcyon</i>    | BEKI        | R                      |
| Blackburnian Warbler             | <i>Setophaga fusca</i>       | BLBW        | M                      |
| Black-capped Chickadee           | <i>Poecile atricapillus</i>  | BCCH        | R                      |
| Blackpoll Warbler                | <i>Setophaga striata</i>     | BLPW        | M                      |
| Blue Jay                         | <i>Cyanocitta cristata</i>   | BLJA        | R                      |
| Blue-gray Gnatcatcher            | <i>Poliophtila caerulea</i>  | BGGN        | SR                     |
| Blue Grosbeak                    | <i>Passerina caerulea</i>    | BLGR        | SR                     |
| Blue-headed Vireo                | <i>Vireo solitarius</i>      | BHVI        | M                      |

<sup>A</sup> Residency: M = migrant through the area; R = year-round resident; SR = summer resident; T = transient; WR = winter resident; according to Sharpe et al. (2001).

<sup>B</sup> Species of regional concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

<sup>C</sup> Resident species recorded only while traveling between survey plots or at other times outside of 5-minute survey periods.

**Table 2 (continued).** Bird species recorded during breeding bird surveys at Homestead National Historical Park, Nebraska, 2009–2022. The American Ornithologists' Union code (AOU code) and residency status of each species is given. Species names are valid and verified names taken from the Integrated Taxonomic Information System web site (ITIS 2023).

| Common Name                   | Scientific Name                 | AOU Code | Residency <sup>A</sup> |
|-------------------------------|---------------------------------|----------|------------------------|
| Bobolink                      | <i>Dolichonyx oryzivorus</i>    | BOBO     | M                      |
| Brown Creeper                 | <i>Certhia americana</i>        | BRCR     | R                      |
| Brown Thrasher                | <i>Toxostoma rufum</i>          | BRTH     | R                      |
| Brown-headed Cowbird          | <i>Molothrus ater</i>           | BHCO     | R                      |
| Canada Goose                  | <i>Branta canadensis</i>        | CANG     | R                      |
| Carolina Wren                 | <i>Thryothorus ludovicianus</i> | CARW     | R                      |
| Cedar Waxwing                 | <i>Bombycilla cedrorum</i>      | CEDW     | R                      |
| Chestnut-sided Warbler        | <i>Setophaga pensylvanica</i>   | CSWA     | M                      |
| Chimney Swift                 | <i>Chaetura pelagica</i>        | CHSW     | SR                     |
| Chipping Sparrow              | <i>Spizella passerina</i>       | CHSP     | SR                     |
| Clay-colored Sparrow          | <i>Spizella pallida</i>         | CCSP     | M                      |
| Cliff Swallow                 | <i>Petrochelidon pyrrhonota</i> | CLSW     | SR                     |
| Common Grackle                | <i>Quiscalus quiscula</i>       | COGR     | R                      |
| Common Nighthawk <sup>C</sup> | <i>Chordeiles minor</i>         | CONI     | SR                     |
| Common Yellowthroat           | <i>Geothlypis trichas</i>       | COYE     | SR                     |
| Cooper's Hawk                 | <i>Accipiter cooperii</i>       | COHA     | R                      |
| Dickcissel                    | <i>Spiza americana</i>          | DICK     | SR                     |
| Downy Woodpecker              | <i>Picoides pubescens</i>       | DOWO     | R                      |
| Eastern Bluebird              | <i>Sialia sialis</i>            | EABL     | R                      |
| Eastern Kingbird              | <i>Tyrannus tyrannus</i>        | EAKI     | SR                     |
| Eastern Meadowlark            | <i>Sturnella magna</i>          | EAME     | R                      |
| Eastern Phoebe                | <i>Sayornis phoebe</i>          | EAPH     | SR                     |
| Eastern Towhee                | <i>Pipilo erythrophthalmus</i>  | EATO     | R                      |
| Eastern Wood-pewee            | <i>Contopus virens</i>          | EAWP     | SR                     |
| Eurasian Collared-dove        | <i>Streptopelia decaocto</i>    | EUCD     | R                      |
| European Starling             | <i>Sturnus vulgaris</i>         | EUST     | R                      |
| Field Sparrow                 | <i>Spizella pusilla</i>         | FISP     | R                      |
| Grasshopper Sparrow           | <i>Ammodramus savannarum</i>    | GRSP     | SR                     |
| Gray Catbird                  | <i>Dumetella carolinensis</i>   | GRCA     | SR                     |
| Great Blue Heron              | <i>Ardea herodias</i>           | GBHE     | SR                     |

<sup>A</sup> Residency: M = migrant through the area; R = year-round resident; SR = summer resident; T = transient; WR = winter resident; according to Sharpe et al. (2001).

<sup>B</sup> Species of regional concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

<sup>C</sup> Resident species recorded only while traveling between survey plots or at other times outside of 5-minute survey periods.

**Table 2 (continued).** Bird species recorded during breeding bird surveys at Homestead National Historical Park, Nebraska, 2009–2022. The American Ornithologists' Union code (AOU code) and residency status of each species is given. Species names are valid and verified names taken from the Integrated Taxonomic Information System web site (ITIS 2023).

| Common Name                               | Scientific Name                          | AOU Code    | Residency <sup>A</sup> |
|-------------------------------------------|------------------------------------------|-------------|------------------------|
| Great Crested Flycatcher                  | <i>Myiarchus crinitus</i>                | GCFL        | SR                     |
| Hairy Woodpecker                          | <i>Picoides villosus</i>                 | HAWO        | R                      |
| Hermit Thrush                             | <i>Catharus guttatus</i>                 | HETH        | M                      |
| House Finch                               | <i>Haemorhous mexicanus</i>              | HOFI        | R                      |
| House Sparrow                             | <i>Passer domesticus</i>                 | HOSP        | R                      |
| House Wren                                | <i>Troglodytes aedon</i>                 | HOWR        | SR                     |
| Indigo Bunting                            | <i>Passerina cyanea</i>                  | INBU        | SR                     |
| Killdeer                                  | <i>Charadrius vociferus</i>              | KILL        | SR                     |
| Lark Sparrow                              | <i>Chondestes grammacus</i>              | LASP        | SR                     |
| Least Flycatcher                          | <i>Empidonax minimus</i>                 | LEFL        | M                      |
| Mallard                                   | <i>Anas platyrhynchos</i>                | MALL        | SR                     |
| Mourning Dove                             | <i>Zenaida macroura</i>                  | MODO        | R                      |
| Nashville Warbler                         | <i>Leiothlypis ruficapilla</i>           | NAWA        | M                      |
| Northern Bobwhite                         | <i>Colinus virginianus</i>               | NOBO        | R                      |
| Northern Cardinal                         | <i>Cardinalis cardinalis</i>             | NOCA        | R                      |
| Northern Flicker                          | <i>Colaptes auratus</i>                  | NOFL        | R                      |
| Northern Rough-winged Swallow             | <i>Stelgidopteryx serripennis</i>        | NRWS        | SR                     |
| Northern Shoveler <sup>C</sup>            | <i>Anas clypeata</i>                     | NSHO        | SR                     |
| Orchard Oriole                            | <i>Icterus spurius</i>                   | OROR        | SR                     |
| Red-bellied Woodpecker                    | <i>Melanerpes carolinus</i>              | RBWO        | R                      |
| Red-eyed Vireo                            | <i>Vireo olivaceus</i>                   | REVI        | SR                     |
| <b>Red-headed Woodpecker <sup>B</sup></b> | <b><i>Melanerpes erythrocephalus</i></b> | <b>RHWO</b> | <b>R</b>               |
| Red-tailed Hawk                           | <i>Buteo jamaicensis</i>                 | RTHA        | R                      |
| Red-winged Blackbird                      | <i>Agelaius phoeniceus</i>               | RWBL        | R                      |
| Ring-necked Pheasant                      | <i>Phasianus colchicus</i>               | RNEP        | R                      |
| Rock Dove                                 | <i>Columba livia</i>                     | ROPI        | R                      |
| Rose-breasted Grosbeak                    | <i>Pheucticus ludovicianus</i>           | RBGR        | SR                     |
| Ruby-crowned Kinglet                      | <i>Regulus calendula</i>                 | RCKI        | M                      |
| Ruby-throated Hummingbird                 | <i>Archilochus colubris</i>              | RTHU        | SR                     |
| Savannah Sparrow <sup>C</sup>             | <i>Passerculus sandwichensis</i>         | SAVS        | SR                     |

<sup>A</sup> Residency: M = migrant through the area; R = year-round resident; SR = summer resident; T = transient; WR = winter resident; according to Sharpe et al. (2001).

<sup>B</sup> Species of regional concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

<sup>C</sup> Resident species recorded only while traveling between survey plots or at other times outside of 5-minute survey periods.

**Table 2 (continued).** Bird species recorded during breeding bird surveys at Homestead National Historical Park, Nebraska, 2009–2022. The American Ornithologists' Union code (AOU code) and residency status of each species is given. Species names are valid and verified names taken from the Integrated Taxonomic Information System web site (ITIS 2023).

| Common Name              | Scientific Name               | AOU Code | Residency <sup>A</sup> |
|--------------------------|-------------------------------|----------|------------------------|
| Scarlet Tanager          | <i>Piranga olivacea</i>       | SCTA     | SR                     |
| Song Sparrow             | <i>Melospiza melodia</i>      | SOSP     | R                      |
| Spotted Towhee           | <i>Pipilo maculatus</i>       | SPTO     | R                      |
| Summer Tanager           | <i>Piranga rubra</i>          | SUTA     | SR                     |
| Swainson's Thrush        | <i>Catharus ustulatus</i>     | SWTH     | M                      |
| Tennessee Warbler        | <i>Leiothlypis peregrina</i>  | TEWA     | M                      |
| Tufted Titmouse          | <i>Baeolophus bicolor</i>     | TUTI     | R                      |
| Turkey Vulture           | <i>Cathartes aura</i>         | TUVU     | SR                     |
| Veery                    | <i>Catharus fuscescens</i>    | VEER     | M                      |
| Warbling Vireo           | <i>Vireo gilvus</i>           | WAVI     | SR                     |
| White-breasted Nuthatch  | <i>Sitta carolinensis</i>     | WBNU     | R                      |
| White-winged Dove        | <i>Zenaida asiatica</i>       | WWDO     | T                      |
| Wild Turkey              | <i>Meleagris gallopavo</i>    | WITU     | R                      |
| Wilson's Warbler         | <i>Cardellina pusilla</i>     | WIWA     | M                      |
| Wood Duck                | <i>Aix sponsa</i>             | WODU     | SR                     |
| Worm-eating Warbler      | <i>Helmitheros vermivorum</i> | WEWA     | M                      |
| Yellow Warbler           | <i>Setophaga petechia</i>     | YEWA     | SR                     |
| Yellow-bellied Sapsucker | <i>Sphyrapicus varius</i>     | YBSA     | WR                     |
| Yellow-billed Cuckoo     | <i>Coccyzus americanus</i>    | YBCU     | SR                     |
| Yellow-throated Vireo    | <i>Vireo flavifrons</i>       | YTVI     | SR                     |

<sup>A</sup> Residency: M = migrant through the area; R = year-round resident; SR = summer resident; T = transient; WR = winter resident; according to Sharpe et al. (2001).

<sup>B</sup> Species of regional concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

<sup>C</sup> Resident species recorded only while traveling between survey plots or at other times outside of 5-minute survey periods.

Eighteen breeding species were observed during the survey period in sufficient numbers to calculate annual abundances with some degree of confidence (Appendix B). Of these 18 species, Dickcissel, Red-winged Blackbird, House Wren, and Common Yellowthroat were the most abundant and widespread species on Homestead National Historical Park. Of these four most abundant species, only Red-winged Blackbird had a change in population size (moderate increase) over the 14 years of monitoring (Figure 3; Appendix D). We were unable to detect with certainty any positive or negative park population trends for the remaining 17 species observed in sufficient numbers to calculate annual abundances. Regional trends (2009–2019) reported by Sauer et al. (2020; Appendix E) for the Central Mixed Grass Prairie Bird Conservation Region were uncertain for 11 of the 18 species,

including the Dickcissel and House Wren. Gray Catbird and Yellow Warbler had increasing populations regionally. However, Brown-headed Cowbird, Common Yellowthroat, Mourning Dove, Northern Bobwhite, Ring-necked Pheasant, and Red-winged Blackbird had declining populations in the region.

Diversity ( $P = 0.57$ ), richness ( $P = 0.50$ ), and evenness in distribution of individuals across species ( $P = 0.72$ ) in the breeding bird community on Homestead National Historical Park were unchanged over the 14 years of monitoring beginning in 2009 (Figure 4). Breeding bird richness averaged 38 species annually on the park.

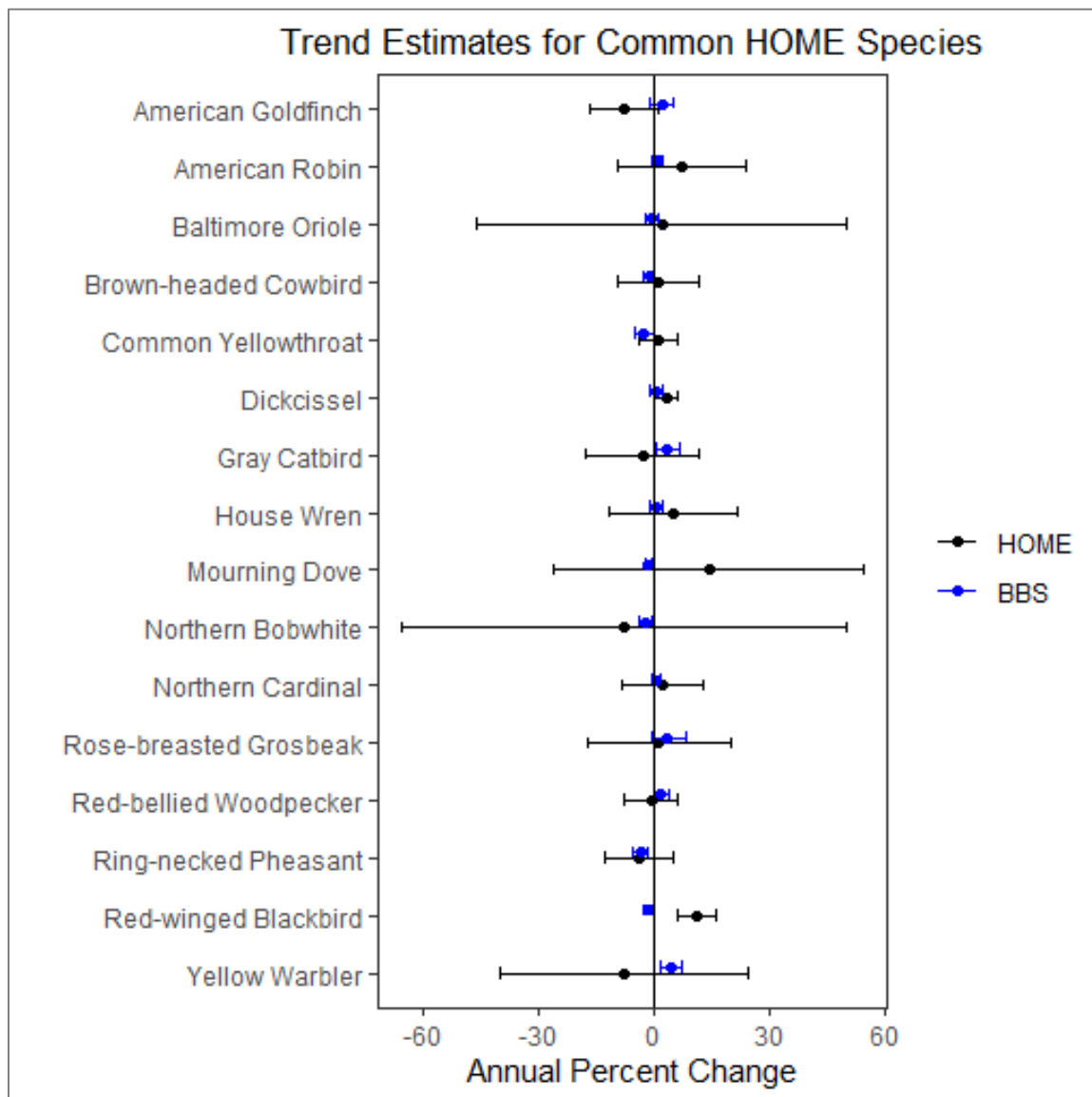


**Figure 3.** Comparison of bird population trends from Homestead National Historical Park (HOME), Nebraska (2009–2022), with those of the larger Central Mixed Grass Prairie Bird Conservation Region (2009–2019) from the USGS Breeding Bird Survey (BBS). Error bars represent 95% confidence intervals. For graphing aesthetics, American Crow (*Corvus brachyrhynchos*) and Blue Jay (*Cyanocitta cristata*) were excluded from the figure because of their large confidence intervals.

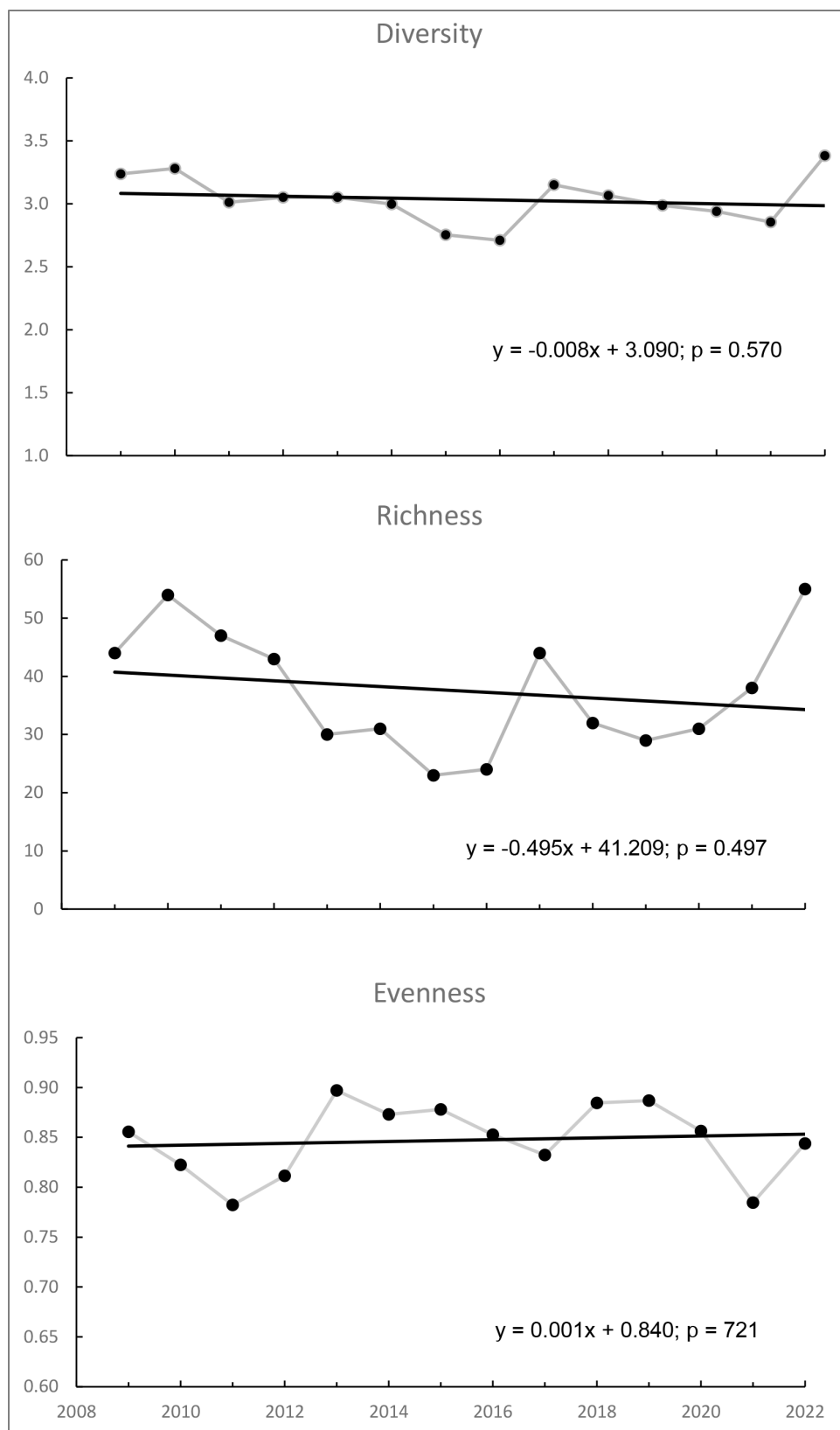


**Figure 4.** Trends in bird community diversity, richness, and species distribution evenness on Homestead National Historical Park, Nebraska, from 2009 through 2022.

## **Habitat Assessment**

When sampled, habitats on the plots at Homestead National Historical Park consisted primarily of the field/prairie (61–63%) and woodland (27–30%) vegetation types, with lesser amounts of other types present (Appendix F). Canopy cover averaged 18 to 33% on plots (Appendix F), with cover provided exclusively by hardwood trees. Basal area of hardwood trees averaged between 7 and 10 m<sup>2</sup>/ha, and canopy height averaged 7 to 10 m. Tree species from 10 different families contributed to the canopy cover and basal area of plots (Appendix F).

Across all plots, the densest vegetation measures at the time of assessment (mid-May to mid-June) occurred in horizontal profile heights below 0.75 m (Appendix F). However, vegetation was measured in all height classes to 2.0 m. Average vertical structural diversity estimates across years ranged from 3 to 17% on plots.

When sampled, plots were primarily unvegetated (69–89% cover) at ground level, with grass litter (39–47% cover) common and bare soil (6–15% cover) exposed (Appendix F). Deciduous litter (7–11% cover), woody debris (4–7% cover), and rock (0 to <1% cover) were also recorded on plots. Total foliar cover (28–64% cover) on plots consisted primarily of cool season grasses (15–22% cover) and forbs (13–22% cover), with lesser amounts of shrubs and vines (1–5% cover), warm season grasses (<1–17% cover), and moss and lichens (0 to <1% cover) present.

## Discussion

Breeding bird surveys were initiated at Homestead National Historical Park in 2009 to assist the park in assessing the integrity of their woodland and grassland areas through time. During the 14 years of monitoring, 98 bird species have been recorded, 81 of which are permanent or summer residents to the area (Sharp et al. 2001). Data collected for these 81 species are valuable for characterizing the park's breeding bird community and their habitat. The two breeding species of concern for the Central Mixed Grass Prairie Bird Conservation Region, Bell's Vireo and Red-headed Woodpecker, should be given additional consideration in the management of natural resources on the park. If it is not feasible to manage habitat for the species of conservation concern directly, then habitat should at least be managed in a way that does not conflict with their needs. For example, conversion of the park's shrubby grassland prairie to mature woodland would be detrimental to the Bell's Vireo, and removal of mature trees would be detrimental to the Red-headed Woodpecker.

Eighteen breeding species were observed during the survey period in sufficient numbers to calculate annual abundances and trends with some degree of confidence. Dickcissel, Red-winged Blackbird, House Wren, and Common Yellowthroat were the most abundant and widespread species on Homestead National Historical Park, and their habitat preferences provide the best characterization of habitat currently present at the park. Dickcissel utilize prairies and weedy fields; Red-winged Blackbirds occupy marshy areas and meadows; House Wrens are found in wood edges in rural and suburban areas; and Common Yellowthroat utilize shrubby fields (Stokes and Stokes 1996). Habitat on the park is a mix of developed areas, restored prairie, successional forest, and Bur Oak woodlands (Kindscher et al. 2011)—habitat that is well suited for the four common and widespread species. The mix of habitat (structural composition) on the park is important for the species of regional concern as their microhabitat requirements vary (Pashley and Barrow 1993). For example, Bell's Vireo utilizes riparian brush and thorny thickets, while Red-headed Woodpeckers prefer farmlands, open woodlands, orchards, and urban/suburban forest (Stokes and Stokes 1996).

A comparison of population trends on Homestead National Historical Park with regional trends in the Central Mixed Grass Prairie Bird Conservation Region was inconclusive. We were unable to detect with certainty any positive or negative population trends for 17 of the 18 species we analyzed (Figure 3; Appendix D). The one trend that appeared was a moderately increasing population of Red-winged Blackbird at the park over the 14 years of monitoring. Regionally, Gray Catbird and Yellow Warbler had increasing populations (Figure 3; Appendix E), while trends showed population declines for Brown-headed Cowbird, Common Yellowthroat, Mourning Dove, Northern Bobwhite, Red-winged Blackbird, and Ring-necked Pheasant. The ten remaining species had uncertain population trends in the Central Mixed Grass Prairie Bird Conservation Region.

Over the 14 years of bird monitoring on Homestead National Historical Park, the stable diversity, richness, and evenness in distribution of individuals across species suggest habitat on the park has remained similar over time (Figure 4) and provides for an array of breeding species. However, this stable species community structure could be altered if significant portions of park grasslands were converted to woodlands or vice versa.

A word of caution is needed here: since we have a limited number of survey years within Homestead National Historical Park, trends and indices may change as more years of data are collected. However, our reported data provide baseline information for understanding bird population trends at Homestead National Historical Park in the context of those seen in the larger Central Mixed Grass Prairie Bird Conservation Region and should help the park make more informed natural resource management decisions. Our reported data also contribute information to efforts of other agencies researching the full life cycle of migratory birds (Partners in Flight, U.S. Geological Survey, U.S. Fish and Wildlife Service, Cornell Lab, Bird Conservancy of the Rockies, etc.).

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## Appendix A. Plots Sampled

**Table 3.** Plots sampled on Homestead National Historical Park, Nebraska, between 2009 and 2022 and gross habitat type. “Yes” indicates plot was sampled; “No” indicates it was not sampled.

| Plot                       | 2009       | 2010       | 2011       | 2012       | 2013       | 2014       | 2015       | 2016       | 2017       | 2018       | 2019       | 2020       | 2021       | 2022       | Plot Type             |
|----------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|
| HOME1                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME2                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| <b>HOME3 <sup>A</sup></b>  | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Grassland/Open</b> |
| HOME4                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME5                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME6                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME7                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| HOME8                      | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME9                      | Yes        | Yes        | Yes        | No         | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| HOME10                     | Yes        | Yes        | Yes        | No         | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| <b>HOME11 <sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Grassland/Open</b> |
| HOME12                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| <b>HOME13 <sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>No</b>  | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Grassland/Open</b> |
| HOME14                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME15                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME16                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME17                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME18                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME19                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME20                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| <b>HOME21 <sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Grassland/Open</b> |
| HOME22                     | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |

<sup>A</sup> Plots that were included in analysis of individual bird species trends (also in bold).

**Table 3 (continued).** Plots sampled on Homestead National Historical Park, Nebraska, between 2009 and 2022 and gross habitat type. “Yes” indicates plot was sampled; “No” indicates it was not sampled.

| Plot                      | 2009       | 2010       | 2011       | 2012       | 2013       | 2014       | 2015       | 2016       | 2017       | 2018       | 2019       | 2020       | 2021       | 2022       | Plot Type             |
|---------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|
| <b>HOME23<sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Grassland/Open</b> |
| HOME24                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| <b>HOME25<sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Grassland/Open</b> |
| HOME26                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| HOME27                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME28                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| HOME29                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Grassland/Open        |
| HOME30                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Grassland/Open        |
| HOME31                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME32                    | Yes        | Yes        | Yes        | No         | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME33                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME34                    | No         | Yes        | Yes        | Yes        | No         | No         | No         | No         | No         | No         | No         | No         | No         | No         | Woodland              |
| HOME35                    | Yes        | Yes        | No         | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME36                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Woodland              |
| <b>HOME37<sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Woodland</b>       |
| HOME38                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| <b>HOME39<sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>No</b>  | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Woodland</b>       |
| HOME40                    | Yes        | No         | No         | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Woodland              |
| HOME41                    | No         | Yes        | Yes        | Yes        | No         | No         | No         | No         | No         | No         | No         | No         | No         | No         | Woodland              |
| HOME42                    | No         | Yes        | Yes        | Yes        | No         | No         | No         | No         | No         | No         | No         | No         | No         | No         | Woodland              |
| HOME43                    | Yes        | Yes        | No         | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME44                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME45                    | Yes        | Yes        | Yes        | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | No         | Yes        | Woodland              |
| HOME46                    | Yes        | Yes        | No         | Yes        | No         | No         | No         | No         | Yes        | No         | No         | No         | Yes        | Yes        | Woodland              |

<sup>A</sup> Plots that were included in analysis of individual bird species trends (also in bold).

**Table 3 (continued).** Plots sampled on Homestead National Historical Park, Nebraska, between 2009 and 2022 and gross habitat type. “Yes” indicates plot was sampled; “No” indicates it was not sampled.

| Plot                      | 2009       | 2010       | 2011       | 2012       | 2013       | 2014       | 2015       | 2016      | 2017       | 2018       | 2019       | 2020       | 2021       | 2022       | Plot Type       |
|---------------------------|------------|------------|------------|------------|------------|------------|------------|-----------|------------|------------|------------|------------|------------|------------|-----------------|
| <b>HOME47<sup>A</sup></b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>No</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Yes</b> | <b>Woodland</b> |
| HOME48                    | No         | Yes        | No         | No         | No         | No         | No         | No        | No         | No         | No         | No         | No         | No         | Woodland        |

<sup>A</sup> Plots that were included in analysis of individual bird species trends (also in bold).

## Appendix B. Proportion of Plots Occupied and Abundance (Corrected for Undetected Individuals)

**Table 4.** Annual proportion of plots occupied by and estimated abundance (determined using Distance software) of breeding bird species at Homestead National Historical Park, Nebraska, during the 2009–2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance using Distance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name          | Proportion of Plots Occupied<br>(Abundance) |                |                |                |               |               |               |               |                |                |               |               |                |                |
|----------------------|---------------------------------------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|----------------|----------------|---------------|---------------|----------------|----------------|
|                      | 2009<br>(n=44)                              | 2010<br>(n=47) | 2011<br>(n=42) | 2012<br>(n=43) | 2013<br>(n=9) | 2014<br>(n=9) | 2015<br>(n=9) | 2016<br>(n=8) | 2017<br>(n=44) | 2018<br>(n=9)  | 2019<br>(n=9) | 2020<br>(n=9) | 2021<br>(n=9)  | 2022<br>(n=44) |
| American Crow        | 0.11<br>(–)                                 | 0.56<br>(9)    | 0.33<br>(15)   | 0.67<br>(16)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(9)    | 0.11<br>(–)    | 0.44<br>(9)   | 0.22<br>(13)  | 0.00<br>(0)    | 0.05<br>(4)    |
| American Goldfinch   | 0.25<br>(379)                               | 0.60<br>(358)  | 0.48<br>(354)  | 0.42<br>(481)  | 0.44<br>(340) | 0.44<br>(749) | 0.22<br>(306) | 0.13<br>(409) | 0.30<br>(340)  | 0.22<br>(102)  | 0.44<br>(817) | 0.22<br>(306) | 0.37<br>(327)  | 0.25<br>(306)  |
| American Robin       | 0.20<br>(106)                               | 0.30<br>(105)  | 0.29<br>(83)   | 0.37<br>(98)   | 0.11<br>(–)   | 0.22<br>(83)  | 0.44<br>(62)  | 0.88<br>(106) | 0.14<br>(104)  | 0.56<br>(133)  | 0.67<br>(99)  | 0.67<br>(99)  | 0.42<br>(83)   | 0.25<br>(105)  |
| Baltimore Oriole     | 0.14<br>(544)                               | 0.36<br>(544)  | 0.36<br>(544)  | 0.09<br>(816)  | 0.22<br>(544) | 0.00<br>(0)   | 0.00<br>(0)   | 0.13<br>(544) | 0.41<br>(672)  | 0.11<br>(544)  | 0.33<br>(725) | 0.22<br>(544) | 0.11<br>(544)  | 0.36<br>(777)  |
| Brown-headed Cowbird | 0.45<br>(414)                               | 0.60<br>(616)  | 0.31<br>(448)  | 0.26<br>(512)  | 0.33<br>(448) | 0.22<br>(224) | 0.11<br>(224) | 0.38<br>(224) | 0.23<br>(256)  | 0.11<br>(896)  | 0.44<br>(299) | 0.56<br>(806) | 0.16<br>(1120) | 0.30<br>(265)  |
| Blue Jay             | 0.02<br>(–)                                 | 0.21<br>(108)  | 0.17<br>(98)   | 0.23<br>(147)  | 0.33<br>(98)  | 0.33<br>(147) | 0.44<br>(73)  | 0.38<br>(130) | 0.14<br>(98)   | 0.22<br>(245)  | 0.22<br>(147) | 0.00<br>(0)   | 0.42<br>(98)   | 0.18<br>(112)  |
| Common Yellowthroat  | 0.41<br>(188)                               | 0.66<br>(328)  | 0.33<br>(177)  | 0.44<br>(180)  | 0.44<br>(81)  | 0.67<br>(226) | 0.33<br>(215) | 0.63<br>(129) | 0.77<br>(219)  | 0.78<br>(323)  | 0.78<br>(230) | 0.33<br>(323) | 0.58<br>(184)  | 0.61<br>(215)  |
| Dickcissel           | 0.30<br>(160)                               | 0.64<br>(212)  | 0.79<br>(258)  | 0.67<br>(249)  | 0.33<br>(219) | 0.67<br>(372) | 0.67<br>(328) | 0.50<br>(438) | 0.61<br>(231)  | 0.56<br>(416)  | 0.67<br>(219) | 0.56<br>(350) | 0.58<br>(389)  | 0.66<br>(242)  |
| Gray Catbird         | 0.09<br>(291)                               | 0.51<br>(255)  | 0.29<br>(194)  | 0.49<br>(212)  | 0.11<br>(194) | 0.44<br>(259) | 0.11<br>(194) | 0.13<br>(194) | 0.27<br>(275)  | 0.22<br>(291)  | 0.33<br>(291) | 0.11<br>(388) | 0.11<br>(194)  | 0.16<br>(194)  |
| House Wren           | 0.20<br>(464)                               | 0.55<br>(512)  | 0.33<br>(530)  | 0.42<br>(751)  | 0.22<br>(246) | 0.33<br>(615) | 0.33<br>(738) | 0.25<br>(983) | 0.39<br>(353)  | 0.33<br>(1147) | 0.44<br>(369) | 0.44<br>(246) | 0.37<br>(738)  | 0.43<br>(311)  |

**Table 4 (continued).** Annual proportion of plots occupied by and estimated abundance (determined using Distance software) of breeding bird species at Homestead National Historical Park, Nebraska, during the 2009–2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance using Distance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name            | Proportion of Plots Occupied<br>(Abundance) |                |                |                |               |               |               |                |                |                |                |               |               |                |
|------------------------|---------------------------------------------|----------------|----------------|----------------|---------------|---------------|---------------|----------------|----------------|----------------|----------------|---------------|---------------|----------------|
|                        | 2009<br>(n=44)                              | 2010<br>(n=47) | 2011<br>(n=42) | 2012<br>(n=43) | 2013<br>(n=9) | 2014<br>(n=9) | 2015<br>(n=9) | 2016<br>(n=8)  | 2017<br>(n=44) | 2018<br>(n=9)  | 2019<br>(n=9)  | 2020<br>(n=9) | 2021<br>(n=9) | 2022<br>(n=44) |
| Mourning Dove          | 0.09<br>(394)                               | 0.47<br>(468)  | 0.29<br>(211)  | 0.28<br>(355)  | 0.00<br>(0)   | 0.67<br>(296) | 0.11<br>(–)   | 0.63<br>(355)  | 0.36<br>(384)  | 0.67<br>(355)  | 0.22<br>(296)  | 0.44<br>(493) | 0.42<br>(380) | 0.18<br>(296)  |
| Northern Bobwhite      | 0.07<br>(49)                                | 0.13<br>(–)    | 0.19<br>(30)   | 0.53<br>(42)   | 0.11<br>(37)  | 0.56<br>(74)  | 0.44<br>(65)  | 0.75<br>(49)   | 0.36<br>(42)   | 0.22<br>(55)   | 0.00<br>(0)    | 0.11<br>(37)  | 0.32<br>(30)  | 0.14<br>(55)   |
| Northern Cardinal      | 0.09<br>(65)                                | 0.17<br>(59)   | 0.12<br>(41)   | 0.26<br>(56)   | 0.22<br>(52)  | 0.11<br>(52)  | 0.56<br>(52)  | 0.13<br>(52)   | 0.20<br>(52)   | 0.33<br>(52)   | 0.22<br>(103)  | 0.56<br>(52)  | 0.26<br>(52)  | 0.16<br>(52)   |
| Rose-breasted Grosbeak | 0.09<br>(368)                               | 0.38<br>(224)  | 0.10<br>(210)  | 0.19<br>(210)  | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.13<br>(421)  | 0.32<br>(275)  | 0.00<br>(0)    | 0.22<br>(316)  | 0.22<br>(210) | 0.05<br>(–)   | 0.18<br>(263)  |
| Red-bellied Woodpecker | 0.07<br>(88)                                | 0.45<br>(88)   | 0.29<br>(77)   | 0.28<br>(144)  | 0.33<br>(88)  | 0.67<br>(106) | 0.33<br>(147) | 0.38<br>(88)   | 0.30<br>(95)   | 0.44<br>(110)  | 0.33<br>(117)  | 0.33<br>(88)  | 0.26<br>(88)  | 0.23<br>(114)  |
| Ring-necked Pheasant   | 0.11<br>(50)                                | 0.72<br>(58)   | 0.86<br>(62)   | 0.42<br>(65)   | 0.33<br>(50)  | 0.78<br>(83)  | 0.33<br>(83)  | 0.63<br>(160)  | 0.36<br>(50)   | 0.33<br>(167)  | 0.56<br>(90)   | 0.44<br>(50)  | 0.47<br>(50)  | 0.41<br>(50)   |
| Red-winged Blackbird   | 0.23<br>(492)                               | 0.60<br>(445)  | 0.50<br>(597)  | 0.56<br>(856)  | 0.56<br>(637) | 0.22<br>(289) | 0.44<br>(941) | 0.63<br>(1640) | 0.48<br>(767)  | 0.44<br>(1303) | 0.78<br>(1075) | 0.67<br>(965) | 0.68<br>(868) | 0.68<br>(948)  |
| Yellow Warbler         | 0.20<br>(131)                               | 0.47<br>(116)  | 0.02<br>(263)  | 0.07<br>(131)  | 0.44<br>(197) | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.05<br>(197)  | 0.00<br>(0)    | 0.00<br>(0)    | 0.11<br>(131) | 0.05<br>(131) | 0.43<br>(197)  |

## Appendix C. Proportion of Plots Occupied and Abundance (Not Corrected for Undetected Individuals)

**Table 5.** Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name                      | Proportion of Plots Occupied<br>(Abundance) |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |
|----------------------------------|---------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                                  | 2009<br>(n=44)                              | 2010<br>(n=47)      | 2011<br>(n=42)      | 2012<br>(n=43)      | 2013<br>(n=9)       | 2014<br>(n=9)       | 2015<br>(n=9)       | 2016<br>(n=8)       | 2017<br>(n=44)      | 2018<br>(n=9)       | 2019<br>(n=9)       | 2020<br>(n=9)       | 2021<br>(n=9)       | 2022<br>(n=44)      |
| American Redstart                | 0.02<br>(2)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.11<br>(12)        | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.16<br>(12)        |
| Bank Swallow                     | 0.02<br>(–)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         |
| Barn Swallow                     | 0.00<br>(0)                                 | 0.06<br>(–)         | 0.07<br>(2)         | 0.14<br>(13)        | 0.00<br>(0)         | 0.00<br>(0)         | 0.11<br>(24)        | 0.00<br>(0)         | 0.00<br>(0)         | 0.11<br>(24)        | 0.00<br>(0)         | 0.11<br>(12)        | 0.05<br>(–)         | 0.02<br>(–)         |
| Barred Owl                       | 0.05<br>(9)                                 | 0.00<br>(0)         | 0.02<br>(–)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         |
| <b>Bell's Vireo <sup>A</sup></b> | <b>0.00<br/>(0)</b>                         | <b>0.15<br/>(9)</b> | <b>0.02<br/>(2)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.00<br/>(0)</b> | <b>0.05<br/>(–)</b> | <b>0.00<br/>(0)</b> |
| Belted Kingfisher                | 0.00<br>(0)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.02<br>(3)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         |
| Black-capped Chickadee           | 0.02<br>(–)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.22<br>(–)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         |
| Blue-gray Gnatcatcher            | 0.00<br>(0)                                 | 0.02<br>(2)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.33<br>(36)        | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.14<br>(7)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         |
| Blue Grosbeak                    | 0.00<br>(0)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.02<br>(2)         |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 5 (continued).** Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name      | Proportion of Plots Occupied<br>(Abundance) |                |                |                |               |               |               |               |                |               |               |               |               |                |
|------------------|---------------------------------------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|---------------|----------------|
|                  | 2009<br>(n=44)                              | 2010<br>(n=47) | 2011<br>(n=42) | 2012<br>(n=43) | 2013<br>(n=9) | 2014<br>(n=9) | 2015<br>(n=9) | 2016<br>(n=8) | 2017<br>(n=44) | 2018<br>(n=9) | 2019<br>(n=9) | 2020<br>(n=9) | 2021<br>(n=9) | 2022<br>(n=44) |
| Brown Creeper    | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.02<br>(3)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Brown Thrasher   | 0.20<br>(10)                                | 0.13<br>(2)    | 0.17<br>(5)    | 0.09<br>(8)    | 0.11<br>(–)   | 0.11<br>(12)  | 0.11<br>(–)   | 0.25<br>(14)  | 0.00<br>(0)    | 0.11<br>(–)   | 0.00<br>(0)   | 0.22<br>(24)  | 0.16<br>(–)   | 0.09<br>(5)    |
| Canada Goose     | 0.00<br>(0)                                 | 0.04<br>(–)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.33<br>(12)  | 0.22<br>(12)  | 0.11<br>(–)   | 0.00<br>(0)   | 0.16<br>(–)    |
| Carolina Wren    | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    |
| Cedar Waxwing    | 0.02<br>(–)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.07<br>(12)   |
| Chimney Swift    | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.11<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Chipping Sparrow | 0.00<br>(0)                                 | 0.02<br>(–)    | 0.02<br>(–)    | 0.02<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(7)    |
| Cliff Swallow    | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.11<br>(36)  | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Common Grackle   | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.11<br>(–)   | 0.11<br>(12)  | 0.38<br>(68)  | 0.00<br>(0)    | 0.11<br>(–)   | 0.22<br>(24)  | 0.00<br>(0)   | 0.05<br>(6)   | 0.02<br>(7)    |
| Cooper’s Hawk    | 0.00<br>(0)                                 | 0.02<br>(2)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Downy Woodpecker | 0.05<br>(2)                                 | 0.04<br>(2)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(2)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.07<br>(5)    |
| Eastern Bluebird | 0.00<br>(0)                                 | 0.04<br>(9)    | 0.02<br>(–)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.11<br>(12)  | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(2)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(6)   | 0.00<br>(0)    |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 5 (continued).** Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name              | Proportion of Plots Occupied<br>(Abundance) |                |                |                |               |               |               |               |                |               |               |               |               |                |
|--------------------------|---------------------------------------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|---------------|----------------|
|                          | 2009<br>(n=44)                              | 2010<br>(n=47) | 2011<br>(n=42) | 2012<br>(n=43) | 2013<br>(n=9) | 2014<br>(n=9) | 2015<br>(n=9) | 2016<br>(n=8) | 2017<br>(n=44) | 2018<br>(n=9) | 2019<br>(n=9) | 2020<br>(n=9) | 2021<br>(n=9) | 2022<br>(n=44) |
| Eastern Kingbird         | 0.05<br>(–)                                 | 0.06<br>(7)    | 0.05<br>(–)    | 0.12<br>(13)   | 0.00<br>(0)   | 0.22<br>(12)  | 0.22<br>(24)  | 0.13<br>(–)   | 0.14<br>(–)    | 0.11<br>(–)   | 0.11<br>(24)  | 0.22<br>(36)  | 0.11<br>(11)  | 0.23<br>(10)   |
| Eastern Meadowlark       | 0.00<br>(0)                                 | 0.09<br>(–)    | 0.02<br>(–)    | 0.05<br>(5)    | 0.22<br>(–)   | 0.22<br>(–)   | 0.22<br>(24)  | 0.00<br>(0)   | 0.18<br>(2)    | 0.22<br>(12)  | 0.33<br>(48)  | 0.11<br>(24)  | 0.32<br>(–)   | 0.14<br>(10)   |
| Eastern Phoebe           | 0.00<br>(0)                                 | 0.04<br>(–)    | 0.05<br>(2)    | 0.09<br>(5)    | 0.00<br>(0)   | 0.11<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    | 0.00<br>(0)   | 0.22<br>(24)  | 0.11<br>(–)   | 0.21<br>(6)   | 0.05<br>(–)    |
| Eastern Towhee           | 0.09<br>(7)                                 | 0.15<br>(7)    | 0.17<br>(2)    | 0.21<br>(25)   | 0.00<br>(0)   | 0.22<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.16<br>(5)    | 0.22<br>(24)  | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(6)   | 0.05<br>(–)    |
| Eastern Wood-pewee       | 0.00<br>(0)                                 | 0.21<br>(5)    | 0.12<br>(2)    | 0.19<br>(18)   | 0.11<br>(–)   | 0.33<br>(60)  | 0.11<br>(12)  | 0.00<br>(0)   | 0.25<br>(12)   | 0.33<br>(24)  | 0.00<br>(0)   | 0.11<br>(12)  | 0.16<br>(–)   | 0.11<br>(2)    |
| Eurasian Collared-dove   | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.22<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(–)   | 0.02<br>(–)    |
| European Starling        | 0.00<br>(0)                                 | 0.13<br>(2)    | 0.07<br>(2)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.11<br>(12)  | 0.11<br>(–)   | 0.11<br>(12)  | 0.00<br>(0)   | 0.05<br>(5)    |
| Field Sparrow            | 0.05<br>(–)                                 | 0.38<br>(–)    | 0.02<br>(–)    | 0.23<br>(23)   | 0.11<br>(–)   | 0.11<br>(–)   | 0.33<br>(15)  | 0.25<br>(27)  | 0.02<br>(–)    | 0.33<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(–)   | 0.02<br>(–)    |
| Grasshopper Sparrow      | 0.02<br>(–)                                 | 0.13<br>(16)   | 0.00<br>(0)    | 0.05<br>(5)    | 0.56<br>(72)  | 0.11<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(5)    | 0.11<br>(12)  | 0.11<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(2)    |
| Great Blue Heron         | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.02<br>(–)    | 0.02<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(–)   | 0.11<br>(6)   | 0.00<br>(0)    |
| Great Crested Flycatcher | 0.09<br>(2)                                 | 0.02<br>(–)    | 0.00<br>(0)    | 0.02<br>(3)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.20<br>(2)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(12)  | 0.05<br>(–)   | 0.18<br>(7)    |
| Hairy Woodpecker         | 0.00<br>(0)                                 | 0.02<br>(–)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(2)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 5 (continued).** Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name                              | Proportion of Plots Occupied<br>(Abundance) |                     |                     |                     |                      |                     |                      |                     |                      |                     |                     |                     |                      |                      |
|------------------------------------------|---------------------------------------------|---------------------|---------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
|                                          | 2009<br>(n=44)                              | 2010<br>(n=47)      | 2011<br>(n=42)      | 2012<br>(n=43)      | 2013<br>(n=9)        | 2014<br>(n=9)       | 2015<br>(n=9)        | 2016<br>(n=8)       | 2017<br>(n=44)       | 2018<br>(n=9)       | 2019<br>(n=9)       | 2020<br>(n=9)       | 2021<br>(n=9)        | 2022<br>(n=44)       |
| House Finch                              | 0.00<br>(0)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.02<br>(–)          |
| House Sparrow                            | 0.00<br>(0)                                 | 0.02<br>(–)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)          |
| Indigo Bunting                           | 0.09<br>(10)                                | 0.04<br>(2)         | 0.02<br>(2)         | 0.05<br>(5)         | 0.11<br>(12)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.13<br>(14)        | 0.16<br>(5)          | 0.00<br>(0)         | 0.11<br>(12)        | 0.00<br>(0)         | 0.00<br>(0)          | 0.14<br>(20)         |
| Killdeer                                 | 0.02<br>(–)                                 | 0.02<br>(–)         | 0.02<br>(–)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)          |
| Lark Sparrow                             | 0.00<br>(0)                                 | 0.00<br>(0)         | 0.02<br>(–)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)          |
| Mallard                                  | 0.00<br>(0)                                 | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.02<br>(–)          |
| Northern Flicker                         | 0.07<br>(–)                                 | 0.11<br>(5)         | 0.02<br>(–)         | 0.07<br>(8)         | 0.11<br>(12)         | 0.11<br>(12)        | 0.00<br>(0)          | 0.00<br>(0)         | 0.07<br>(2)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.07<br>(5)          |
| Northern Rough-winged Swallow            | 0.00<br>(0)                                 | 0.04<br>(2)         | 0.00<br>(0)         | 0.02<br>(–)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.13<br>(14)        | 0.00<br>(0)          | 0.22<br>(36)        | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.05<br>(–)          |
| Orchard Oriole                           | 0.00<br>(0)                                 | 0.04<br>(5)         | 0.02<br>(2)         | 0.00<br>(0)         | 0.22<br>(48)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.02<br>(5)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.11<br>(12)        | 0.05<br>(6)          | 0.09<br>(12)         |
| Red-eyed Vireo                           | 0.02<br>(2)                                 | 0.04<br>(2)         | 0.00<br>(0)         | 0.02<br>(3)         | 0.11<br>(–)          | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)         | 0.11<br>(7)          | 0.00<br>(0)         | 0.11<br>(12)        | 0.00<br>(0)         | 0.00<br>(0)          | 0.07<br>(7)          |
| <b>Red-headed Woodpecker<sup>A</sup></b> | <b>0.16<br/>(10)</b>                        | <b>0.09<br/>(–)</b> | <b>0.10<br/>(2)</b> | <b>0.02<br/>(–)</b> | <b>0.22<br/>(12)</b> | <b>0.00<br/>(0)</b> | <b>0.11<br/>(24)</b> | <b>0.00<br/>(0)</b> | <b>0.27<br/>(15)</b> | <b>0.11<br/>(–)</b> | <b>0.11<br/>(–)</b> | <b>0.00<br/>(0)</b> | <b>0.16<br/>(11)</b> | <b>0.14<br/>(12)</b> |
| Red-tailed Hawk                          | 0.05<br>(–)                                 | 0.00<br>(0)         | 0.02<br>(–)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.11<br>(–)         | 0.00<br>(0)          | 0.13<br>(14)        | 0.02<br>(–)          | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)         | 0.00<br>(0)          | 0.00<br>(0)          |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 5 (continued).** Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name               | Proportion of Plots Occupied<br>(Abundance) |                |                |                |               |               |               |               |                |               |               |               |               |                |
|---------------------------|---------------------------------------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|---------------|----------------|
|                           | 2009<br>(n=44)                              | 2010<br>(n=47) | 2011<br>(n=42) | 2012<br>(n=43) | 2013<br>(n=9) | 2014<br>(n=9) | 2015<br>(n=9) | 2016<br>(n=8) | 2017<br>(n=44) | 2018<br>(n=9) | 2019<br>(n=9) | 2020<br>(n=9) | 2021<br>(n=9) | 2022<br>(n=44) |
| Rock Dove                 | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(12)  | 0.00<br>(0)   | 0.00<br>(0)    |
| Ruby-throated Hummingbird | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.02<br>(3)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Scarlet Tanager           | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(1)    |
| Song Sparrow              | 0.05<br>(5)                                 | 0.40<br>(21)   | 0.07<br>(–)    | 0.05<br>(3)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(2)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Spotted Towhee            | 0.00<br>(0)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.05<br>(3)    | 0.00<br>(0)   | 0.11<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    |
| Summer Tanager            | 0.05<br>(5)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(2)    |
| Tufted Titmouse           | 0.02<br>(–)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    |
| Turkey Vulture            | 0.05<br>(–)                                 | 0.02<br>(–)    | 0.02<br>(–)    | 0.02<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(–)   | 0.05<br>(–)    |
| Warbling Vireo            | 0.00<br>(0)                                 | 0.19<br>(9)    | 0.05<br>(–)    | 0.07<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(–)   | 0.00<br>(0)   | 0.09<br>(5)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.05<br>(–)   | 0.27<br>(25)   |
| White-breasted Nuthatch   | 0.02<br>(2)                                 | 0.13<br>(5)    | 0.14<br>(2)    | 0.12<br>(10)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.07<br>(3)    | 0.11<br>(24)  | 0.22<br>(36)  | 0.00<br>(0)   | 0.05<br>(–)   | 0.09<br>(5)    |
| Wild Turkey               | 0.02<br>(–)                                 | 0.06<br>(–)    | 0.05<br>(10)   | 0.00<br>(0)    | 0.11<br>(12)  | 0.33<br>(–)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.11<br>(–)   | 0.33<br>(–)   | 0.00<br>(0)   | 0.05<br>(–)   | 0.00<br>(0)    |
| Wood Duck                 | 0.05<br>(–)                                 | 0.09<br>(–)    | 0.02<br>(2)    | 0.02<br>(–)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.02<br>(–)    | 0.00<br>(0)   | 0.11<br>(24)  | 0.11<br>(12)  | 0.00<br>(0)   | 0.00<br>(0)    |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 5 (continued).** Annual proportion of plots occupied by each breeding bird species and estimated abundance (determined using birds within 50 m of plot center) of each species at Homestead National Historical Park, Nebraska, during the 2009 to 2022 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when an annual abundance value could not be calculated because the species was present, but distance measures from observers could not be determined.

| Common Name           | Proportion of Plots Occupied<br>(Abundance) |                |                |                |               |               |               |               |                |               |               |               |               |                |
|-----------------------|---------------------------------------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|---------------|----------------|
|                       | 2009<br>(n=44)                              | 2010<br>(n=47) | 2011<br>(n=42) | 2012<br>(n=43) | 2013<br>(n=9) | 2014<br>(n=9) | 2015<br>(n=9) | 2016<br>(n=8) | 2017<br>(n=44) | 2018<br>(n=9) | 2019<br>(n=9) | 2020<br>(n=9) | 2021<br>(n=9) | 2022<br>(n=44) |
| Yellow-billed Cuckoo  | 0.00<br>(0)                                 | 0.02<br>(–)    | 0.05<br>(–)    | 0.00<br>(0)    | 0.11<br>(–)   | 0.11<br>(–)   | 0.00<br>(0)   | 0.13<br>(–)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.11<br>(12)  | 0.16<br>(6)   | 0.09<br>(10)   |
| Yellow-throated Vireo | 0.02<br>(3)                                 | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)    | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.00<br>(0)   | 0.07<br>(–)    |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

## Appendix D. Homestead National Historical Park Trends

**Table 6.** Trends, annual change in abundance (individuals), of breeding birds recorded on Homestead National Historical Park, Nebraska, from 2009 through 2022.

| Common Name            | Trend <sup>A</sup> | SE of Slope | Trend Classification <sup>B</sup> |
|------------------------|--------------------|-------------|-----------------------------------|
| American Crow          | 1.00               | 0.37        | Uncertain                         |
| American Goldfinch     | 0.92               | 0.05        | Uncertain                         |
| American Robin         | 1.07               | 0.09        | Uncertain                         |
| Baltimore Oriole       | 1.02               | 0.25        | Uncertain                         |
| Brown-headed Cowbird   | 1.01               | 0.06        | Uncertain                         |
| Blue Jay               | 1.10               | 0.63        | Uncertain                         |
| Common Yellowthroat    | 1.01               | 0.03        | Uncertain                         |
| Dickcissel             | 1.03               | 0.02        | Uncertain                         |
| Gray Catbird           | 0.97               | 0.08        | Uncertain                         |
| House Wren             | 1.05               | 0.09        | Uncertain                         |
| Mourning Dove          | 1.14               | 0.21        | Uncertain                         |
| Northern Bobwhite      | 0.92               | 0.30        | Uncertain                         |
| Northern Cardinal      | 1.02               | 0.06        | Uncertain                         |
| Rose-breasted Grosbeak | 1.01               | 0.10        | Uncertain                         |
| Red-bellied Woodpecker | 0.99               | 0.04        | Uncertain                         |
| Ring-necked Pheasant   | 0.96               | 0.05        | Uncertain                         |
| Red-winged Blackbird   | 1.11               | 0.03        | Moderate increase                 |
| Yellow Warbler         | 0.92               | 0.17        | Uncertain                         |

<sup>A</sup> Trends were determined using the statistical software package 'rtrim' built under R version 3.6.3.

<sup>B</sup> Trend classification types depend on statistical significance and magnitude (Pannekoek and van Strien 2005; van Strien et al. 2001) and follow Gregory et al. (2007). The multiplicative overall slope estimate in TRIM was converted into one of the following categories depending on the overall slope as well as its 95% confidence interval (= slope  $\pm$  1.96 times the standard error of the slope). Strong increase: increase significantly more than 5% per year; criterion is lower limit of confidence interval > 1.05. Moderate increase: significant increase, but not significantly more than 5% per year; criterion is 1.00 < lower limit of confidence interval < 1.05. Stable: no significant increase or decline, and it is certain that trends are less than 5% per year; criterion is confidence interval encloses 1.00 but lower limit > 0.95 and upper limit < 1.05. Uncertain: no significant increase or decline, but not certain if trends are less than 5% per year; criterion is confidence interval encloses 1.00 but lower limit < 0.95 or upper limit > 1.05. Moderate decline: significant decline, but not significantly more than 5% per year; criterion is 0.95 < upper limit of confidence interval < 1.00. Steep decline: decline significantly more than 5% per year; criterion is upper limit of confidence interval < 0.95.

## Appendix E. Regional Trends

**Table 7.** Regional trends (Central Mixed Grass Prairie Bird Conservation Region) in breeding birds recorded on Homestead National Historical Park, Nebraska, from 2009 through 2019. Regional trend data were obtained from the USGS Breeding Bird Surveys (BBS) Program (Sauer et al. 2020). Trend is defined as an interval-specific geometric mean of proportional changes in population size (Link and Sauer 1998), expressed as a percentage. NA signifies that few observations of the species were made so calculations of trends could not be made.

| Common Name                      | Annual Percent Change in Population Size | Lower End of 95% Confidence Interval | Upper End of 95% Confidence Interval |
|----------------------------------|------------------------------------------|--------------------------------------|--------------------------------------|
| American Crow                    | -0.93                                    | -2.76                                | 0.88                                 |
| American Goldfinch               | 1.79                                     | -1.20                                | 4.91                                 |
| American Redstart                | NA                                       | NA                                   | NA                                   |
| American Robin                   | 0.75                                     | -0.51                                | 1.98                                 |
| American Woodcock                | NA                                       | NA                                   | NA                                   |
| Baltimore Oriole                 | -0.80                                    | -2.31                                | 0.69                                 |
| Bank Swallow                     | 0.02                                     | -9.50                                | 11.16                                |
| Barn Swallow                     | -1.95                                    | -3.28                                | -0.65                                |
| Barred Owl                       | 1.46                                     | -3.59                                | 6.86                                 |
| <b>Bell's Vireo <sup>A</sup></b> | <b>3.58</b>                              | <b>0.92</b>                          | <b>6.44</b>                          |
| Belted Kingfisher                | -1.55                                    | -5.05                                | 2.15                                 |
| Black-capped Chickadee           | -2.76                                    | -6.82                                | 1.49                                 |
| Blue Jay                         | 0.95                                     | -0.67                                | 2.52                                 |
| Blue-gray Gnatcatcher            | 0.47                                     | -3.48                                | 4.54                                 |
| Blue Grosbeak                    | -0.15                                    | -2.13                                | 1.87                                 |
| Brown Creeper                    | NA                                       | NA                                   | NA                                   |
| Brown Thrasher                   | -0.75                                    | -2.04                                | 0.53                                 |
| Brown-headed Cowbird             | -1.45                                    | -2.71                                | -0.21                                |
| Canada Goose                     | 4.39                                     | -6.14                                | 16.59                                |
| Carolina Wren                    | 4.53                                     | 0.27                                 | 8.63                                 |
| Cedar Waxwing                    | 15.00                                    | 2.87                                 | 28.89                                |
| Chimney Swift                    | -3.30                                    | -5.93                                | -0.79                                |
| Chipping Sparrow                 | 2.34                                     | -1.17                                | 5.95                                 |
| Cliff Swallow                    | 7.85                                     | 2.96                                 | 13.28                                |
| Common Grackle                   | -3.23                                    | -4.93                                | -1.66                                |
| Common Nighthawk                 | 0.29                                     | -1.86                                | 2.53                                 |
| Common Yellowthroat              | -2.70                                    | -5.26                                | -0.31                                |
| Cooper's Hawk                    | 1.34                                     | -3.25                                | 6.20                                 |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 7 (continued).** Regional trends (Central Mixed Grass Prairie Bird Conservation Region) in breeding birds recorded on Homestead National Historical Park, Nebraska, from 2009 through 2019. Regional trend data were obtained from the USGS Breeding Bird Surveys (BBS) Program (Sauer et al. 2020). Trend is defined as an interval-specific geometric mean of proportional changes in population size (Link and Sauer 1998), expressed as a percentage. NA signifies that few observations of the species were made so calculations of trends could not be made.

| <b>Common Name</b>            | <b>Annual Percent Change in Population Size</b> | <b>Lower End of 95% Confidence Interval</b> | <b>Upper End of 95% Confidence Interval</b> |
|-------------------------------|-------------------------------------------------|---------------------------------------------|---------------------------------------------|
| Dickcissel                    | 0.34                                            | -1.38                                       | 2.14                                        |
| Downy Woodpecker              | NA                                              | NA                                          | NA                                          |
| Eastern Bluebird              | -0.33                                           | -2.96                                       | 2.34                                        |
| Eastern Kingbird              | -2.23                                           | -3.74                                       | -0.72                                       |
| Eastern Meadowlark            | -2.19                                           | -4.08                                       | -0.30                                       |
| Eastern Phoebe                | 0.24                                            | -1.92                                       | 2.48                                        |
| Eastern Towhee                | 1.78                                            | -2.65                                       | 7.25                                        |
| Eastern Wood-pewee            | 2.53                                            | -0.71                                       | 6.01                                        |
| Eurasian Collared-dove        | 9.90                                            | 5.91                                        | 13.89                                       |
| European Starling             | -2.21                                           | -4.44                                       | 0.01                                        |
| Field Sparrow                 | -0.66                                           | -2.58                                       | 1.32                                        |
| Grasshopper Sparrow           | -3.74                                           | -5.63                                       | -1.81                                       |
| Gray Catbird                  | 3.34                                            | 0.61                                        | 6.45                                        |
| Great Blue Heron              | -1.63                                           | -4.35                                       | 1.24                                        |
| Great Crested Flycatcher      | 1.05                                            | -0.71                                       | 2.81                                        |
| Hairy Woodpecker              | 1.63                                            | -1.26                                       | 4.55                                        |
| House Finch                   | -0.04                                           | -4.08                                       | 4.10                                        |
| House Sparrow                 | -0.41                                           | -2.22                                       | 1.47                                        |
| House Wren                    | 0.14                                            | -1.44                                       | 1.79                                        |
| Indigo Bunting                | -0.64                                           | -2.71                                       | 1.65                                        |
| Killdeer                      | -0.75                                           | -2.24                                       | 0.72                                        |
| Lark Sparrow                  | -1.38                                           | -3.25                                       | 0.45                                        |
| Mallard                       | 0.70                                            | -3.59                                       | 5.65                                        |
| Mourning Dove                 | -1.64                                           | -2.63                                       | -0.66                                       |
| Northern Bobwhite             | -2.57                                           | -4.11                                       | -0.99                                       |
| Northern Cardinal             | 0.21                                            | -0.92                                       | 1.34                                        |
| Northern Flicker              | NA                                              | NA                                          | NA                                          |
| Northern Rough-winged Swallow | -2.31                                           | -5.62                                       | 1.28                                        |
| Northern Shoveler             | 5.98                                            | -4.53                                       | 20.06                                       |
| Orchard Oriole                | -0.46                                           | -2.46                                       | 1.56                                        |
| Red-bellied Woodpecker        | 1.67                                            | -0.35                                       | 3.59                                        |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

**Table 7 (continued).** Regional trends (Central Mixed Grass Prairie Bird Conservation Region) in breeding birds recorded on Homestead National Historical Park, Nebraska, from 2009 through 2019. Regional trend data were obtained from the USGS Breeding Bird Surveys (BBS) Program (Sauer et al. 2020). Trend is defined as an interval-specific geometric mean of proportional changes in population size (Link and Sauer 1998), expressed as a percentage. NA signifies that few observations of the species were made so calculations of trends could not be made.

| Common Name                               | Annual Percent Change in Population Size | Lower End of 95% Confidence Interval | Upper End of 95% Confidence Interval |
|-------------------------------------------|------------------------------------------|--------------------------------------|--------------------------------------|
| Red-eyed Vireo                            | 2.75                                     | -0.79                                | 6.65                                 |
| <b>Red-headed Woodpecker <sup>A</sup></b> | <b>1.60</b>                              | <b>-0.52</b>                         | <b>3.72</b>                          |
| Red-tailed Hawk                           | 0.59                                     | -1.16                                | 2.31                                 |
| Red-winged Blackbird                      | -1.64                                    | -2.82                                | -0.47                                |
| Ring-necked Pheasant                      | -3.71                                    | -5.57                                | -1.84                                |
| Rock Dove                                 | -0.40                                    | -3.59                                | 5.07                                 |
| Rose-breasted Grosbeak                    | 3.35                                     | -0.75                                | 7.93                                 |
| Ruby-throated Hummingbird                 | -1.34                                    | -6.92                                | 4.40                                 |
| Savannah Sparrow                          | NA                                       | NA                                   | NA                                   |
| Scarlet Tanager                           | NA                                       | NA                                   | NA                                   |
| Song Sparrow                              | -1.04                                    | -4.89                                | 3.26                                 |
| Spotted Towhee                            | 1.97                                     | -2.22                                | 6.72                                 |
| Summer Tanager                            | 8.32                                     | 2.58                                 | 15.45                                |
| Tufted Titmouse                           | NA                                       | NA                                   | NA                                   |
| Turkey Vulture                            | 1.63                                     | -1.14                                | 4.41                                 |
| Warbling Vireo                            | -2.01                                    | -3.95                                | -0.09                                |
| White-breasted Nuthatch                   | 0.05                                     | -3.77                                | 4.10                                 |
| Wild Turkey                               | -3.79                                    | -8.07                                | 0.64                                 |
| Wood Duck                                 | 2.10                                     | -3.35                                | 8.18                                 |
| Yellow Warbler                            | 4.08                                     | 1.39                                 | 6.87                                 |
| Yellow-billed Cuckoo                      | 0.41                                     | -1.82                                | 2.78                                 |
| Yellow-throated Vireo                     | NA                                       | NA                                   | NA                                   |

<sup>A</sup> Species of conservation concern for the Central Mixed Grass Prairie Bird Conservation Region (USFWS 2008; also in bold).

## Appendix F. Habitat Parameters

Habitat parameter averages in three different plot sizes are shown in Tables 8 through 10. Table 11 shows stem densities of trees by size class.

**Table 8.** Average percent cover ( $\pm$ standard deviation) of each habitat type in 50 m plots at Homestead National Historical Park, Nebraska, during the bird breeding seasons from 2009 to 2022 (n = number of plots samples). Total percent cover across habitat types may not sum to 100% as values are averaged over mid-point values of cover classes (i.e., class 1 = 0.5%, class 2 = 3.0%, class 3 = 15.0%, class 4 = 37.5%, class 5 = 62.5%, class 6 = 85.0%, and class 7 = 97.5%).

| Habitat Parameter        | 2009 (n = 44)        | 2013 (n = 9)         | 2017 (n = 44)        | 2022 (n = 44)        |
|--------------------------|----------------------|----------------------|----------------------|----------------------|
| Field/Prairie (%)        | 63.22 ( $\pm$ 41.37) | 61.67 ( $\pm$ 46.25) | 62.61 ( $\pm$ 40.2)  | 60.68 ( $\pm$ 39.64) |
| Highway Right of Way (%) | 0.67 ( $\pm$ 3.13)   | 0.00                 | 0.34 ( $\pm$ 2.26)   | 0.34 ( $\pm$ 2.26)   |
| Lawn (%)                 | 0.33 ( $\pm$ 2.24)   | 0.00                 | 0.34 ( $\pm$ 2.26)   | 0.34 ( $\pm$ 2.26)   |
| Paved Road (%)           | 0.67 ( $\pm$ 3.13)   | 0.00                 | 0.75 ( $\pm$ 3.18)   | 0.82 ( $\pm$ 3.19)   |
| Shrub (%)                | 0.00                 | 0.00                 | 0.48 ( $\pm$ 2.33)   | 3.03 ( $\pm$ 5.77)   |
| Stream (%)               | 2.13 ( $\pm$ 5.14)   | 1.67 ( $\pm$ 5.00)   | 2.56 ( $\pm$ 7.22)   | 2.19 ( $\pm$ 5.19)   |
| Trail (%)                | 1.33 ( $\pm$ 3.81)   | 0.00                 | 2.13 ( $\pm$ 4.78)   | 2.23 ( $\pm$ 4.75)   |
| Woodland (%)             | 30.06 ( $\pm$ 43.37) | 27.5 ( $\pm$ 45.15)  | 27.13 ( $\pm$ 38.12) | 28.15 ( $\pm$ 39.37) |

**Table 9.** Average ( $\pm$  standard deviation) canopy cover, canopy height, basal area, percent cover of vegetation at various horizontal height increments to 2.0 m, and vertical structural diversity in 5 m subplots at Homestead National Historical Park, Nebraska, during the bird breeding seasons from 2009 to 2022 (n = number of subplots samples). For percent cover data, total percent cover may not sum to 100% as values are averaged over mid-point values of cover classes (i.e., class 1 = 0.5%, class 2 = 3.0%, class 3 = 15.0%, class 4 = 37.5%, class 5 = 62.5%, class 6 = 85.0%, and class 7 = 97.5%).

| Habitat Parameter                                                                                                      | Subcategory                   | 2009 (n = 44)         | 2013 (n = 9)          | 2017 (n = 44)         | 2022 (n = 44)         |
|------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Canopy Cover                                                                                                           | Hardwood (%)                  | 32.59 ( $\pm 44.93$ ) | 17.56 ( $\pm 26.94$ ) | 28.17 ( $\pm 39.89$ ) | 28.59 ( $\pm 39.78$ ) |
|                                                                                                                        | Conifer (%)                   | 0                     | 0                     | 0                     | 0                     |
|                                                                                                                        | Total Cover (%)               | 32.59 ( $\pm 44.93$ ) | 17.56 ( $\pm 26.94$ ) | 28.17 ( $\pm 39.89$ ) | 28.59 ( $\pm 39.89$ ) |
| Canopy Height                                                                                                          | Hardwood (m)                  | 8.82 ( $\pm 11.62$ )  | 8.44 ( $\pm 12.89$ )  | 7.40 ( $\pm 10.90$ )  | 9.52 ( $\pm 12.52$ )  |
|                                                                                                                        | Conifer (m)                   | 0.00                  | 0.00                  | 0.00                  | 0.27 ( $\pm 1.81$ )   |
| Basal Area                                                                                                             | Hardwood (m <sup>2</sup> /ha) | 7.61 ( $\pm 11.05$ )  | 7.22 ( $\pm 11.14$ )  | 9.60 ( $\pm 14.28$ )  | 9.55 ( $\pm 14.26$ )  |
|                                                                                                                        | Conifer (m <sup>2</sup> /ha)  | 0.00                  | 0.00                  | 0.06 ( $\pm 0.38$ )   | 0.06 ( $\pm 0.38$ )   |
|                                                                                                                        | Total (m <sup>2</sup> /ha)    | 7.61 ( $\pm 11.00$ )  | 7.22 ( $\pm 11.10$ )  | 9.66 ( $\pm 14.30$ )  | 9.55 ( $\pm 14.30$ )  |
| Horizontal Vegetation Profile—<br>measured at 15 m north of plot center (percent cover at different height increments) | 0.00–0.25 m (%)               | 66.79 ( $\pm 42.83$ ) | 96.11 ( $\pm 4.17$ )  | 96.70 ( $\pm 5.28$ )  | 97.22 ( $\pm 1.88$ )  |
|                                                                                                                        | 0.25–0.50 m (%)               | 56.81 ( $\pm 43.91$ ) | 60.39 ( $\pm 40.93$ ) | 92.91 ( $\pm 15.94$ ) | 85.82 ( $\pm 26.19$ ) |
|                                                                                                                        | 0.50–0.75 m (%)               | 21.37 ( $\pm 34.11$ ) | 23.94 ( $\pm 35.29$ ) | 34.58 ( $\pm 36.21$ ) | 44.11 ( $\pm 40.47$ ) |
|                                                                                                                        | 0.75–1.00 m (%)               | 11.21 ( $\pm 24.84$ ) | 14.50 ( $\pm 22.00$ ) | 20.26 ( $\pm 31.95$ ) | 27.83 ( $\pm 37.52$ ) |
|                                                                                                                        | 1.00–1.25 m (%)               | 7.03 ( $\pm 18.44$ )  | 3.67 ( $\pm 6.50$ )   | 10.83 ( $\pm 23.72$ ) | 22.80 ( $\pm 37.63$ ) |
|                                                                                                                        | 1.25–1.50 m (%)               | 3.28 ( $\pm 13.02$ )  | 10.83 ( $\pm 32.50$ ) | 4.02 ( $\pm 15.76$ )  | 12.47 ( $\pm 27.63$ ) |
|                                                                                                                        | 1.50–1.75 m (%)               | 5.74 ( $\pm 19.73$ )  | 10.83 ( $\pm 32.50$ ) | 6.52 ( $\pm 21.66$ )  | 13.94 ( $\pm 28.61$ ) |
|                                                                                                                        | 1.75–2.00 m (%)               | 6.48 ( $\pm 22.10$ )  | 6.94 ( $\pm 20.83$ )  | 5.77 ( $\pm 21.13$ )  | 11.11 ( $\pm 27.04$ ) |
| Vertical Structure Diversity (%)                                                                                       | n/a                           | 13.91 ( $\pm 11.97$ ) | 2.88 ( $\pm 7.07$ )   | 17.08 ( $\pm 12.06$ ) | 14.60 ( $\pm 9.47$ )  |

**Table 10.** Average percent ( $\pm$  standard deviation) of soil substrate cover and plant guild cover in 1.78 m sample plots at Homestead National Historical Park, Nebraska, during the bird breeding seasons from 2008 to 2021 (n = number of subplots sampled). Total percent coverages may not necessarily sum to 100% as values are averaged over mid-point values of cover classes (i.e., class 1 = 0.5%, class 2 = 3.0%, class 3 = 15.0%, class 4 = 37.5%, class 5 = 62.5%, class 6 = 85.0%, and class 7 = 97.5%).

| Habitat Parameter     | 2009 (n = 44)        | 2013 (n = 9)         | 2017 (n = 44)        | 2022 (n = 44)        |
|-----------------------|----------------------|----------------------|----------------------|----------------------|
| Deciduous Litter (%)  | 10.98 ( $\pm$ 20.70) | 10.50 ( $\pm$ 20.51) | 6.52 ( $\pm$ 13.18)  | 9.89 ( $\pm$ 21.21)  |
| Grass Litter (%)      | 46.54 ( $\pm$ 34.32) | 47.11 ( $\pm$ 40.43) | 39.06 ( $\pm$ 27.22) | 45.95 ( $\pm$ 35.82) |
| Bare Soil (%)         | 7.01 ( $\pm$ 14.88)  | 6.67 ( $\pm$ 12.50)  | 5.58 ( $\pm$ 11.24)  | 14.65 ( $\pm$ 18.23) |
| Rock (%)              | 0.06 ( $\pm$ 0.16)   | 0.00                 | 0.00                 | 0.34 ( $\pm$ 2.26)   |
| Woody Debris (%)      | 7.12 ( $\pm$ 10.95)  | 3.94 ( $\pm$ 6.33)   | 3.65 ( $\pm$ 8.61)   | 5.85 ( $\pm$ 16.01)  |
| Unvegetated (%)       | 88.56 ( $\pm$ 10.20) | 69.44 ( $\pm$ 26.18) | 78.58 ( $\pm$ 30.25) | 73.93 ( $\pm$ 26.91) |
| Warm-season Grass (%) | 3.06 ( $\pm$ 8.39)   | 0.11 ( $\pm$ 0.22)   | 17.25 ( $\pm$ 21.12) | 13.60 ( $\pm$ 18.39) |
| Cool-season Grass (%) | 21.79 ( $\pm$ 29.78) | 14.67 ( $\pm$ 19.03) | 20.52 ( $\pm$ 29.91) | 15.22 ( $\pm$ 19.21) |
| Forb (%)              | 13.36 ( $\pm$ 16.41) | 14.83 ( $\pm$ 9.96)  | 19.76 ( $\pm$ 16.18) | 21.94 ( $\pm$ 22.66) |
| Moss and Lichen (%)   | 0.01 ( $\pm$ 0.07)   | 0.00                 | 0.39 ( $\pm$ 2.26)   | 0.07 ( $\pm$ 0.17)   |
| Shrubs and Vines (%)  | 1.44 ( $\pm$ 3.80)   | 0.61 ( $\pm$ 0.93)   | 5.26 ( $\pm$ 10.76)  | 5.31 ( $\pm$ 12.43)  |
| Tree Seedling (%)     | 0.11 ( $\pm$ 0.46)   | 0.06 ( $\pm$ 0.17)   | 0.05 ( $\pm$ 0.15)   | 0.07 ( $\pm$ 0.17)   |
| Total Foliar (%)      | 39.03 ( $\pm$ 35.70) | 28.06 ( $\pm$ 20.87) | 62.61 ( $\pm$ 22.15) | 63.64 ( $\pm$ 23.77) |

**Table 11.** Stems per hectare for trees found at Homestead National Historical Park, Nebraska, by size class, during the 2009 to 2022 bird breeding seasons (n = number of plots sampled). Tree stems per hectare are reported by family.

| Stem Size Class | Family        | 2009 (n = 44) | 2013 (n = 9) | 2017 (n = 44) | 2022 (n = 44) |
|-----------------|---------------|---------------|--------------|---------------|---------------|
| <1.0 cm         | Anacardiaceae | 0             | 113          | 0             | 0             |
|                 | Cornaceae     | 14            | 523          | 0             | 0             |
|                 | Oleaceae      | 3             | 0            | 0             | 0             |
|                 | Rosaceae      | 20            | 0            | 38            | 0             |
|                 | Ulmaceae      | 3             | 0            | 0             | 0             |
| 1.1–2.85 cm     | Cornaceae     | 3             | 0            | 0             | 0             |
|                 | Oleaceae      | 3             | 0            | 0             | 0             |
|                 | Rosaceae      | 8             | 0            | 12            | 0             |
|                 | Ulmaceae      | 3             | 0            | 3             | 0             |
|                 | Snag          | 105           | 0            | 0             | 0             |
| 2.6–8.0 cm      | Oleaceae      | 0             | 0            | 3             | 3             |
|                 | Rosaceae      | 31            | 0            | 9             | 0             |
|                 | Ulmaceae      | 34            | 57           | 14            | 12            |
|                 | Snag          | 25            | 0            | 3             | 0             |
| 8.1–15.0 cm     | Fagaceae      | 6             | 0            | 0             | 0             |
|                 | Oleaceae      | 3             | 0            | 3             | 0             |
|                 | Ulmaceae      | 25            | 14           | 20            | 17            |
|                 | Snag          | 3             | 14           | 3             | 0             |
| 15.1–23.0 cm    | Aceraceae     | 6             | 0            | 3             | 0             |
|                 | Fagaceae      | 0             | 0            | 3             | 3             |
|                 | Moraceae      | 6             | 0            | 0             | 0             |
|                 | Oleaceae      | 8             | 0            | 12            | 6             |
|                 | Ulmaceae      | 28            | 14           | 29            | 17            |
|                 | Snag          | 0             | 0            | 9             | 0             |
| 23.1–38.0 cm    | Aceraceae     | 0             | 0            | 6             | 3             |
|                 | Moraceae      | 0             | 0            | 3             | 0             |
|                 | Oleaceae      | 3             | 0            | 0             | 6             |
|                 | Ulmaceae      | 23            | 0            | 20            | 29            |
| >38.0 cm        | Aceraceae     | 0             | 0            | 3             | 0             |
|                 | Juglandaceae  | 3             | 0            | 0             | 0             |
|                 | Moraceae      | 0             | 0            | 3             | 0             |
|                 | Oleaceae      | 0             | 0            | 3             | 0             |
|                 | Salicaceae    | 3             | 0            | 0             | 0             |
|                 | Ulmaceae      | 11            | 28           | 12            | 14            |
|                 | Snag          | 0             | 0            | 3             | 3             |

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