



Bird Monitoring at Pipestone National Monument, Minnesota

Status Report 2009–2017

Natural Resource Report NPS/HTLN/NRR—2019/1939



ON THE COVER
Prairie at Pipestone National Monument
Photography by NPS/Heartland Inventory and Monitoring Network

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Executive Summary

In 2009, the Heartland Inventory & Monitoring Network initiated breeding bird surveys on Pipestone National Monument, Minnesota, to address two objectives: (1) to monitor changes in bird community composition and abundance, and (2) to improve our understanding of relationships between breeding birds and habitat, and the effects of management actions on those relationships. This report evaluates trends in the park's breeding bird populations in the context of trends observed within the North American Bird Conservation Initiative's (NABCI) Prairie Potholes Bird Conservation Region, the region in which the park is located. By doing so, we can 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 Pipestone National Monument.

Ninety-two species of birds were recorded during May and June site visits in the nine years since initiating monitoring. Eighty of the species are considered breeding species because they are permanent or summer residents. Six of the breeding species recorded on Pipestone National Monument are species of concern for the Prairie Potholes Bird Conservation Region. Twelve species were observed during the survey period in sufficient numbers to calculate annual abundances and trends with some degree of confidence.

The Bobolink (*Dolichonyx oryzivorus*), Clay-colored Sparrow (*Spizella pallida*), and Common Grackle (*Quiscalus quiscula*) were the most abundant and widespread species on Pipestone National Monument. Six of the species with sufficient numbers to calculate trends on the park had increasing populations, and no species had a population in decline. Within the Prairie Potholes Bird Conservation Region, only three of the species with positive population trends on the park had positive trends. Only one species, Red-winged Blackbird (*Agelaius phoeniceus*), with an uncertain trend on the park had a positive trend region-wide. Common Yellowthroat (*Geothlypis trichas*) had a strong increasing population on the park, but its population is declining within the region. The remaining species had uncertain population trends region-wide. Our findings suggests that for most bird species, populations on the park are faring as well/or better than populations in the region.

This report provides current regional and local breeding bird trends for future comparisons with bird data collected as part of the long-term monitoring efforts at Pipestone National Monument. This information will help park staff plan management objectives and assess the effectiveness of management alternatives. These monitoring data also provide park staff with additional information for interpreting natural resources.

Acknowledgments

We would like to thank the staff of Pipestone National Monument, Minnesota for allowing us to access the park during our site visits. We would also like to thank park staff and volunteers who assisted with bird surveys on the park: Leticia A. Blauert, Susan C. Bury, Sarah E. Campbell, Jordan W. Croatt, Seth B. Hendriks, Chris D. Langland, Peter R. Loso, Julianne L. Pierson, Shannon M. Regan, Sarah E. Schmit, Creighton C. Schroyer, and Jonathan A. Wendel.

Introduction

Birds are an important component of park ecosystems, as 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, such as neotropical migrants, can have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991; Maurer 1993). Moreover, birds have a tremendous following among the public and many parks provide information on the status and trends of birds through their interpretive programs.

Pipestone National Monument, Minnesota, is located on the southeastern edge of the Prairie

Potholes Bird Conservation Region (Figure 1). This bird conservation region is one of 67 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 2012).

The Prairie Potholes Bird Conservation Region is a glaciated area of mixed-grass prairie in the west and tallgrass prairie in the east (NABCI 2012). This is the most important waterfowl production area on the North American continent, despite extensive wetland drainage and tillage of native grasslands. The region comprises the core of the breeding range of most

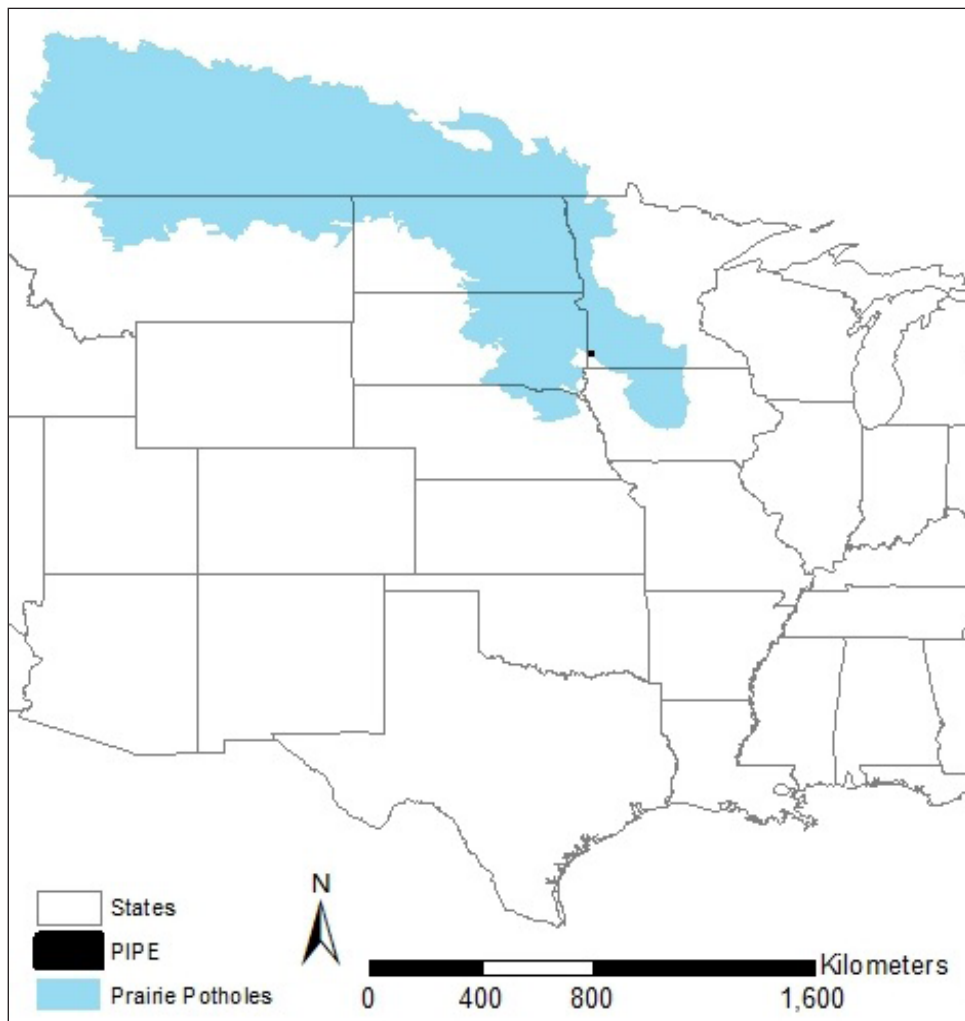


Figure 1. Location of Pipestone National Monument (PIPE), Minnesota, within the Prairie Potholes Bird Conservation Region.

dabbling duck and several diving duck species, and provides critical breeding and migration habitat for over 200 other bird species, including many species of continental concern. Approximately 105 of the 200 species of breeding birds can be found in and around Pipestone National Monument (Janssen et al. 2003). Continued wetland degradation, widespread habitat loss to agriculture and urban and industrial development, and fragmentation of remaining grasslands threaten many species in the region.

Data collected during the U.S. Geological Survey's (USGS) annual North American Breeding Bird Surveys (BBS) between 2005 and 2015 indicate that a number (31) of potential breeding bird species occurring at Pipestone National Monument show evidence of population decline (Sauer et al. 2017). In fact, 34% of the bird species in the Prairie Potholes 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 Sedge Wren (*Cistothorus platensis*) declining at alarming rates.

Long-term trends in community composition and abundance of breeding bird populations provide one measure for assessing the ecological stability and sustainability of a system. We will use trends in the composition and abundance of bird populations as long-term indicators of ecosystem stability at Pipestone National Monument. *Ecosystem stability*

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. 2004; Mallory et al. 2006; Wood et al. 2006). Therefore, changes in the numbers and composition of bird communities may reflect the effectiveness of management actions implemented to restore and maintain bird habitat at the park.

There are two primary objectives for monitoring breeding birds at Pipestone National Monument:

- 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 nine years (2009–2017) 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). 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 68 permanent plots on Pipestone National Monument (Figure 2). However, due to various reasons (i.e. volunteer availability and other reasons) the number of plots sample annually ranged from 17 to 68 (Table 1).

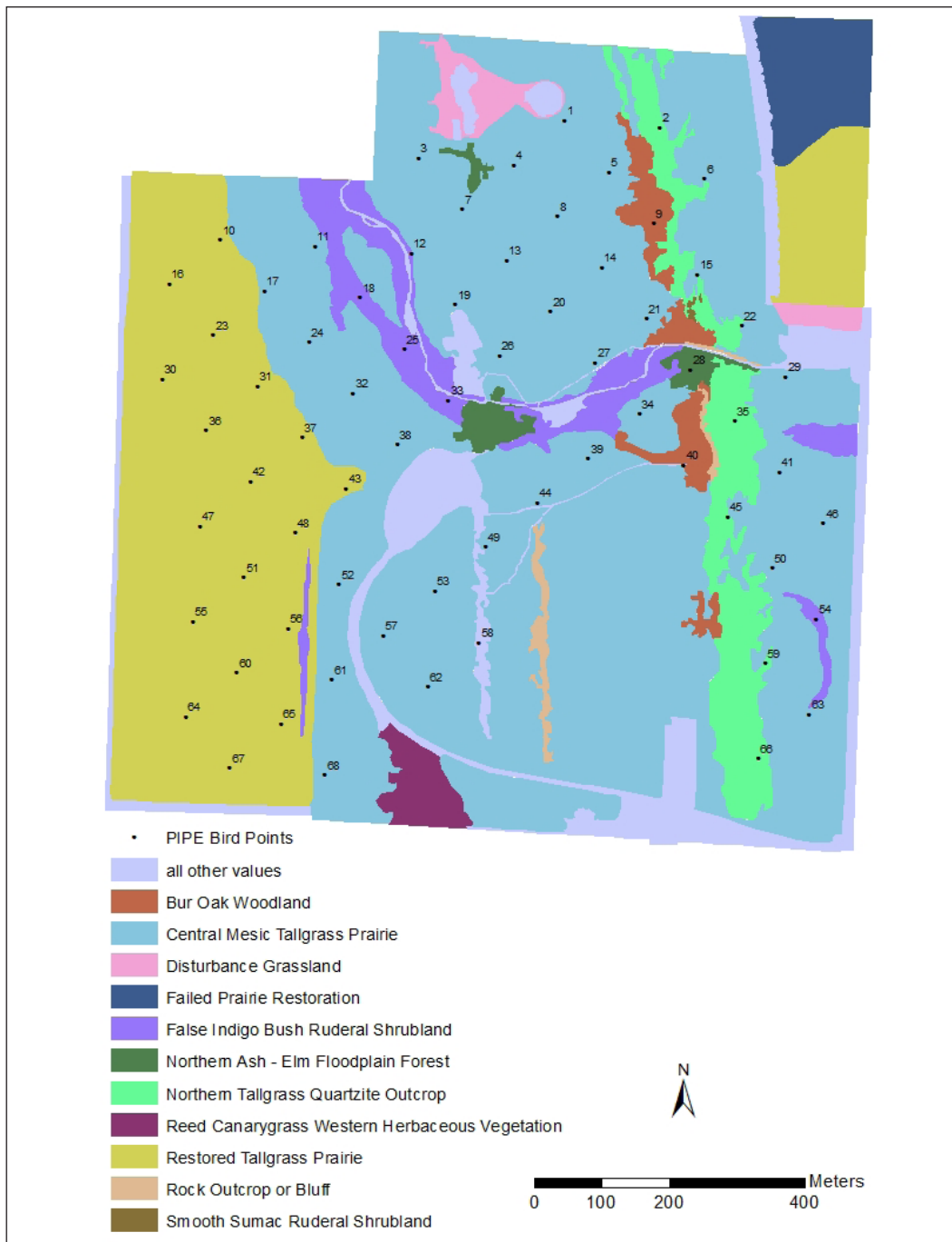


Figure 2. Bird plot locations on Pipestone National Monument (PIPE), Minnesota. Vegetation mapping and classification provided by Diamond et al. (2014).

Table 1. Number of plots sampled and sampling dates for breeding bird surveys conducted at Pipestone National Monument, Minnesota, by year. Also listed are observer(s) who conducted the surveys and whether or not habitat data were collected during the survey year.

Year	Sampling Dates	Number of Plots Sampled	Observer(s)	Habitat Data Collected
2009	May 14 – May 16	68	D. G. Peitz*	Yes
2010	May 27 – June 4	67	L. A. Blauert, J. W. Croatt, S. B. Hendriks, and P. R. Loso	No
2011	May 26 – June 9	68	S. B. Hendriks, J. L. Pierson, and C. C. Schroyer	No
2012	June 5 – June 8	67	S. B. Hendriks and J. A. Wendel	No
2013	May 15 – May 16	17	D. G. Peitz*	Yes
2014	June 4 – June 9	17	S. B. Hendriks and C. D. Langland	No
2015	June 6 - June 10	17	S. E. Campbell, C. D. Langland, and S. M. Regan	No
2016	June 1 – June 2	17	S. B. Hendriks, C. D. Langland, S. C. Bury, and S. E. Schmit	No
2017	May 18 – May 19	68	D. G. Peitz* and D. W. Marcum	Yes

* Heartland I&M Network staff.

During bird surveys in 2009, monitoring plots were located using navigation waypoints (Peitz 2010) in a Trimble Geo XT GPS unit and temporarily marked with 36-in 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 and 2017, the habitat assessment crews worked independent of the bird surveyor, and monitoring plots were located using a GPS unit but not marked with pin flags. From 2010 to 2012 and 2014 to 2016, habitat assessments were not conducted. Bird monitoring plots in these years were also located using a GPS unit and 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-min 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 GPS unit. While traveling between plots, the observer was vigilant for the presence of species not recorded during timed surveys. These species 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 starting when it was light enough to observe birds to four hours after sunrise.

Variable circular plot counts were conducted in an attempt to get an “instantaneous count” of all birds present. The observer recorded birds flushed from a plot when approached and the counts were 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-min surveys are included.

Data Analysis

Prior to summary analysis, the residency status (migrant, outside normal range, permanent resident, summer resident, and winter resident) of each bird species recorded was determined. Identifying the

residency of each species helps to exclude species outside their normal range, migrants, and winter residents from analysis of breeding birds within Pipestone National Monument. 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 recorded (12 species), Distance software (Distance 6.0 Release 2) was used to determine park-wide abundance (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), and the most robust models were selected by Distance based on the lowest Akaike Information Criteria (AIC) values.

The hazard-rate + simple polynomial function was selected for eight species: American Goldfinch (*Spinus tristis*), American Robin (*Turdus migratorius*), Brown-headed Cowbird (*Molothrus ater*), Clay-colored Sparrow (*Spizella pallida*), Common Grackle (*Quiscalus quiscula*), Common Yellowthroat (*Geothlypis trichas*), Grasshopper Sparrow (*Ammodramus savannarum*), and Ring-necked Pheasant (*Phasianus colchicus*). The half-normal + cosine function was selected for four species: Bobolink (*Dolichonyx oryzivorus*), Dickcissel (*Spiza americana*), Red-winged Blackbird (*Agelaius phoeniceus*), and Song Sparrow (*Melospiza melodia*). 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 TRIM Version 3.54 statistical software (Pannekoek and van Strien 2005; Appendix D). TRIM is a program developed for the analysis of count data obtained from wildlife population monitoring. It



Bobolink (*Dolichonyx oryzivorus*) at Pipestone National Monument. NPS

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 taken into account with this software. Although TRIM has the capacity to estimate missing data, we restricted our regression analysis to 17 plots that were surveyed in most years (Appendix A). By doing this, we analyzed a consistent ratio of the various habitat types across years.

For this report we also obtained regional breeding bird trends for the Prairie Potholes Bird Conservation Region during the period of 2005 to 2015 (Appendix E; Sauer et al. 2017). It is possible to determine trends for many bird species, and many regions of interest for periods ranging from 1966 to 2015 by using the interactive calculator available at <https://www.mbr-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 without going too far beyond the sampling period at Pipestone National Monument.

We compared regional trends with those calculated using TRIM for Pipestone National Monument bird populations (Figure 3). 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 Pipestone National Monument were assessed by regressing each metric against survey years in the add-in statistical software of Microsoft Excel 2010, and then graphing the results. Prior to trend analysis, bird community diversity values were calculated annually using the Shannon Diversity Index:

$$H' = -\sum(n_i/N)\ln(n_i/N)$$

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 (J):

$$J' = H'/H_{\text{max}}$$

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).

Because some species occurring in an area may not actually be observed in a survey (i.e., rare species may be missed), recorded species richness is often an underestimate. Statistical species richness estimators

utilize the information in species distribution and abundance patterns to produce an estimate of true species richness. Species richness estimators are also useful in comparing surveys with unequal sampling effort (e.g., different numbers of plots) since more species are usually discovered with greater sampling effort. Different species richness estimators will produce varying estimates, however, and no single estimator is consistently superior to others. Nonparametric statistical estimators have generally performed better than parametric types (Walther and Moore 2005). Reese et al. (2014) recently reviewed nonparametric species richness estimators, and found that two coverage-based estimators, the Abundance Coverage-based Estimator (ACE) and Incidence Coverage-based Estimator (ICE), provide less biased and more accurate estimates than many of the others. Thus, we employed these two species richness estimators and report estimated species richness along with observed species richness. The software application, EstimateS (Colwell 2013) was used to calculate the ACE and ICE estimators.



American Goldfinch (*Spinus tristis*). NPS

Results

Bird Surveys

Between 2009 and 2017, 406 cumulative plots were surveyed and 92 different bird species were recorded, 80 of which are species with the potential to breed within the park (Table 2; Janssen et al. 2003). Six of the breeding species recorded, Black Tern (*Chlidonias niger*), Dickcissel (*Spiza americana*),

Grasshopper Sparrow (*Ammodramus sava-narum*), Least Bittern (*Ixobrychus exilis*), Swainson's Hawk (*Buteo swainsoni*), and Upland Sandpiper (*Bartramia longicauda*) are considered species of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008).

Table 2. Bird species recorded during breeding bird surveys at Pipestone National Monument, Minnesota, from 2009 through 2017. 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 website (ITIS 2017).

Common name	Species name	AOU code	Residency ^A
American Crow	<i>Corvus brachyrhynchos</i>	AMCR	R
American Goldfinch	<i>Spinus tristis</i>	AMGO	R
American Restart	<i>Setophaga ruticilla</i>	AMRE	SR
American Robin	<i>Turdus migratorius</i>	AMRO	R
Baltimore Oriole	<i>Icterus galbula</i>	BAOR	SR
Bank Swallow	<i>Riparia riparia</i>	BANS	SR
Barn Swallow	<i>Hirundo rustica</i>	BARS	SR
Belted Kingfisher	<i>Megaceryle alcyon</i>	BEKI	SR
Black and White Warbler	<i>Mniotilta varia</i>	BAWW	SR
Black-capped Chickadee	<i>Poecile atricapillus</i>	BCCH	R
Blackpoll Warbler	<i>Setophaga striata</i>	BLPW	M
Black Tern^C	<i>Chlidonias niger</i>	BLTE	SR
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
Blue-winged Teal	<i>Anas discors</i>	BWTE	SR
Bobolink	<i>Dolichonyx oryzivorus</i>	BOBO	SR
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	BRBL	O
Brown Thrasher	<i>Toxostoma rufum</i>	BRTH	SR
Brown-headed Cowbird	<i>Molothrus ater</i>	BHCO	SR
Canada Goose	<i>Branta canadensis</i>	CAGO	SR
Cedar Waxwing	<i>Bombycilla cedrorum</i>	CEDW	R
Cerulean Warbler	<i>Setophaga cerulea</i>	CERW	M
Chimney Swift	<i>Chaetura pelagica</i>	CHSW	SR

^A Residency: M = migrant through the area; R = year around resident; SR = summer resident (According to Jackson et al. [1996]).

^B Species recorded only while traveling between survey plots or at other times outside of 5-min survey periods.

^C Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

Table 2 (continued). Bird species recorded during breeding bird surveys at Pipestone National Monument, Minnesota, from 2009 through 2017. 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 website (ITIS 2017).

Common name	Species name	AOU code	Residency ^A
Chipping Sparrow	<i>Spizella passerina</i>	CHSP	SR
Clay-colored Sparrow	<i>Spizella pallida</i>	CCSP	SR
Common Grackle	<i>Quiscalus quiscula</i>	COGR	SR
Common Nighthawk	<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
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	DCCO	SR
Downy Woodpecker	<i>Picoides pubescens</i>	DOWO	R
Eastern Kingbird	<i>Tyrannus tryannus</i>	EAKI	SR
Eastern Meadowlark	<i>Sturnella magna</i>	EAME	O
Eastern Phoebe	<i>Sayornis phoebe</i>	EAPH	SR
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	EATO	SR
European Starling	<i>Sturnus vulgaris</i>	EUST	R
Field Sparrow	<i>Spizella pusilla</i>	FISP	SR
Grasshopper Sparrow^C	<i>Ammodramus savannarum</i>	GRSP	SR
Gray Catbird	<i>Dumetella carolinensis</i>	GRCA	SR
Great Blue Heron	<i>Ardea herodias</i>	GBHE	SR
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	GCFL	SR
Green Heron	<i>Butorides virescens</i>	GRHE	SR
Hairy Woodpecker	<i>Picoides villosus</i>	HAWO	R
Henslow's Sparrow	<i>Ammodramus henslowii</i>	HESP	SR
Horned Lark	<i>Eremophila alpestris</i>	HOLA	R
House Finch	<i>Haemorhous mexicanus</i>	HOFI	R
House Sparrow	<i>Passer domesticus</i>	HOSP	SR
House Wren	<i>Troglodytes aedon</i>	HOWR	SR
Killdeer	<i>Charadrius vociferus</i>	KILL	SR
Lapland Longspur ^B	<i>Calcarius lapponicus</i>	LALO	WR
Least Bittern^C	<i>Ixobrychus exilis</i>	LEBI	SR
Least Flycatcher	<i>Empidonax minimus</i>	LEFL	SR
Mallard	<i>Anas platyrhynchos</i>	MALL	R
Marsh Wren	<i>Cistothorus palustris</i>	MAWR	SR
Mourning Dove	<i>Zenaida macroura</i>	MODO	R
Nashville Warbler	<i>Leiothlypis ruficapilla</i>	NAWA	M
Northern Flicker	<i>Colaptes auratus</i>	YSFL	R

^A Residency: M = migrant through the area; R = year around resident; SR = summer resident (According to Jackson et al. [1996]).

^B Species recorded only while traveling between survey plots or at other times outside of 5-min survey periods.

^C Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

Table 2 (continued). Bird species recorded during breeding bird surveys at Pipestone National Monument, Minnesota, from 2009 through 2017. 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 website (ITIS 2017).

Common name	Species name	AOU code	Residency ^A
Northern Harrier	<i>Circus cyaneus</i>	NOHA	R
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	NRWS	SR
Northern Shoveler	<i>Anas clypeata</i>	NSHO	SR
Orchard Oriole	<i>Icterus spurius</i>	OROR	SR
Red-tailed Hawk	<i>Buteo jamaicensis</i>	RTHA	R
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	RWBL	SR
Ring-necked Pheasant	<i>Phasianus colchicus</i>	RPHE	R
Rock Dove	<i>Columba livia</i>	RODO	R
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	RTHU	M
Savannah Sparrow	<i>Passerculus sandwichensis</i>	SAVS	SR
Sedge Wren	<i>Cistothorus platensis</i>	SEWR	SR
Song Sparrow	<i>Melospiza melodia</i>	SOSP	R
Sora	<i>Porzana carolina</i>	SORA	SR
Swainson's Hawk^C	<i>Buteo swainsoni</i>	SWHA	SR
Tennessee Warbler	<i>Leiothlypis peregrina</i>	TEWA	M
Tree Swallow	<i>Tachycineta bicolor</i>	TRES	SR
Turkey Vulture	<i>Cathartes aura</i>	TUVU	SR
Upland Sandpiper^C	<i>Bartramia longicauda</i>	UPSA	SR
Vesper Sparrow	<i>Poocetes gramineus</i>	VESP	SR
Warbling Vireo	<i>Vireo gilvus</i>	WAVI	SR
Western Kingbird	<i>Tyrannus verticalis</i>	WEKI	SR
Western Meadowlark	<i>Sturnella neglecta</i>	WEME	SR
White-crowned Sparrow ^B	<i>Zonotrichia leucophrys</i>	WCSP	M
Wild Turkey	<i>Meleagris gallopavo</i>	WITU	R
Willow Flycatcher	<i>Empidonax traillii</i>	WIFL	SR
Wilson's Warbler	<i>Cardellina pusilla</i>	WIWA	M
Wood Duck	<i>Aix sponsa</i>	WODU	SR
Yellow Warbler	<i>Setophaga petechia</i>	YWAR	SR
Yellow-breasted Chat	<i>Icteria virens</i>	YBCH	O
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	YHBL	SR
Yellow-rumped Warbler	<i>Setophaga coronata</i>	MYWA	SR
Yellow-throated Vireo	<i>Vireo flavifrons</i>	YTVI	SR

^A Residency: M = migrant through the area; R = year around resident; SR = summer resident (According to Jackson et al. [1996]).

^B Species recorded only while traveling between survey plots or at other times outside of 5-min survey periods.

^C Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

Twelve breeding species were observed during the survey period in sufficient numbers to calculate annual abundances with some degree of confidence (Appendix B). Of these twelve species, Bobolink (*Dolichonyx oryzivorus*), Clay-colored Sparrow (*Spizella pallida*), and Common Grackle (*Quiscalus quiscula*) were the most abundant and widespread species on Pipestone National Monument. Two of the twelve species recorded, Common Yellowthroat (*Geothlypis trichas*) and Ring-necked Pheasant (*Phasianus colchicus*), had strong increases in population size over the nine years of monitoring (Figure 3; Appendix D). Four additional species, American Goldfinch (*Carduelis tristis*), American Robin (*Turdus migratorius*), Bobolink, and Common Grackle, had moderate increases in population size. We were unable to detect with certainty either positive or negative population trends for five of the six remaining species reported. One species, Song Sparrow (*Melospiza melodia*) had an unreliable population trend estimate.

Regional trends (2005–2015) reported by Sauer et al. (2017, Figure 3; Appendix E) for the Prairie Potholes Bird Conservation Region were uncertain

for seven of the twelve species, including the Bobolink and Ring-necked Pheasant. One species with a strong population increase on the park, the Common Yellowthroat had a declining population region-wide. Three species with moderate increases in populations on the park, American Goldfinch, American Robin, and Common Grackle, also had region-wide population increases. The Red-winged Blackbird (*Agelaius phoeniceus*) had a population increasing region-wide, but trend was uncertain on the park.

Diversity ($p = 0.35$), richness ($p = 0.64$), and evenness ($p = 0.39$) in distribution of individuals across species in the breeding bird community on Pipestone National Monument were unchanged over the nine monitoring years since 2009 (Figure 4). Bird richness averaged 42 species annually on the park. Average estimated species richness was 50 by the ACE estimator and 54 by the ICE estimator. These results should be interpreted with caution, however, as inter-annual variability in the number of plots sampled may have influenced estimation metrics.

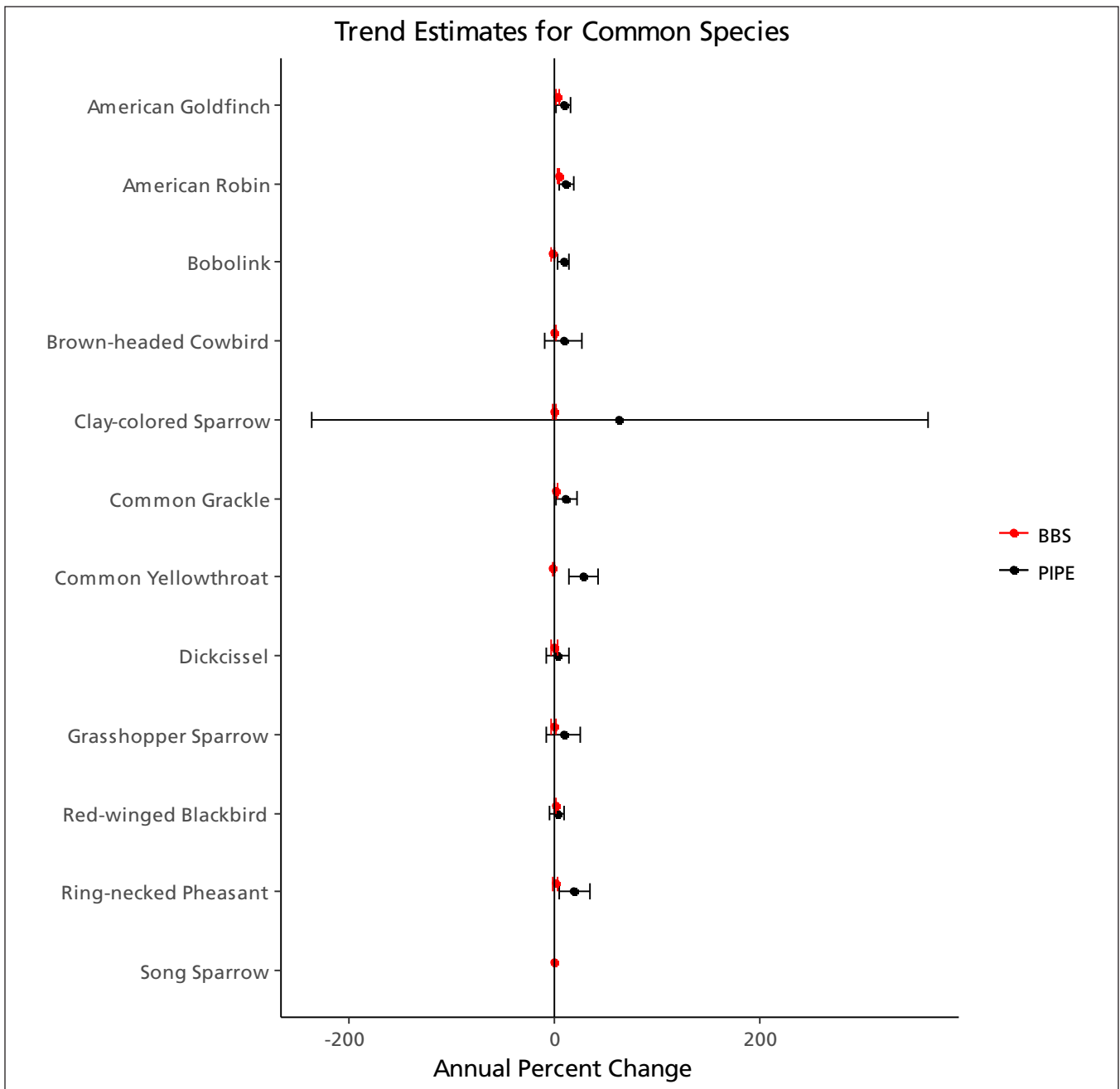


Figure 3. Comparison of bird population trends from Pipestone National Monument (PIPE), Minnesota, (2009 through 2017) with those of the larger Prairie Potholes Prairie Bird Conservation Region (2005 through 2015) from the Breeding Bird Surveys (BBS). Error bars represent 95% confidence intervals.

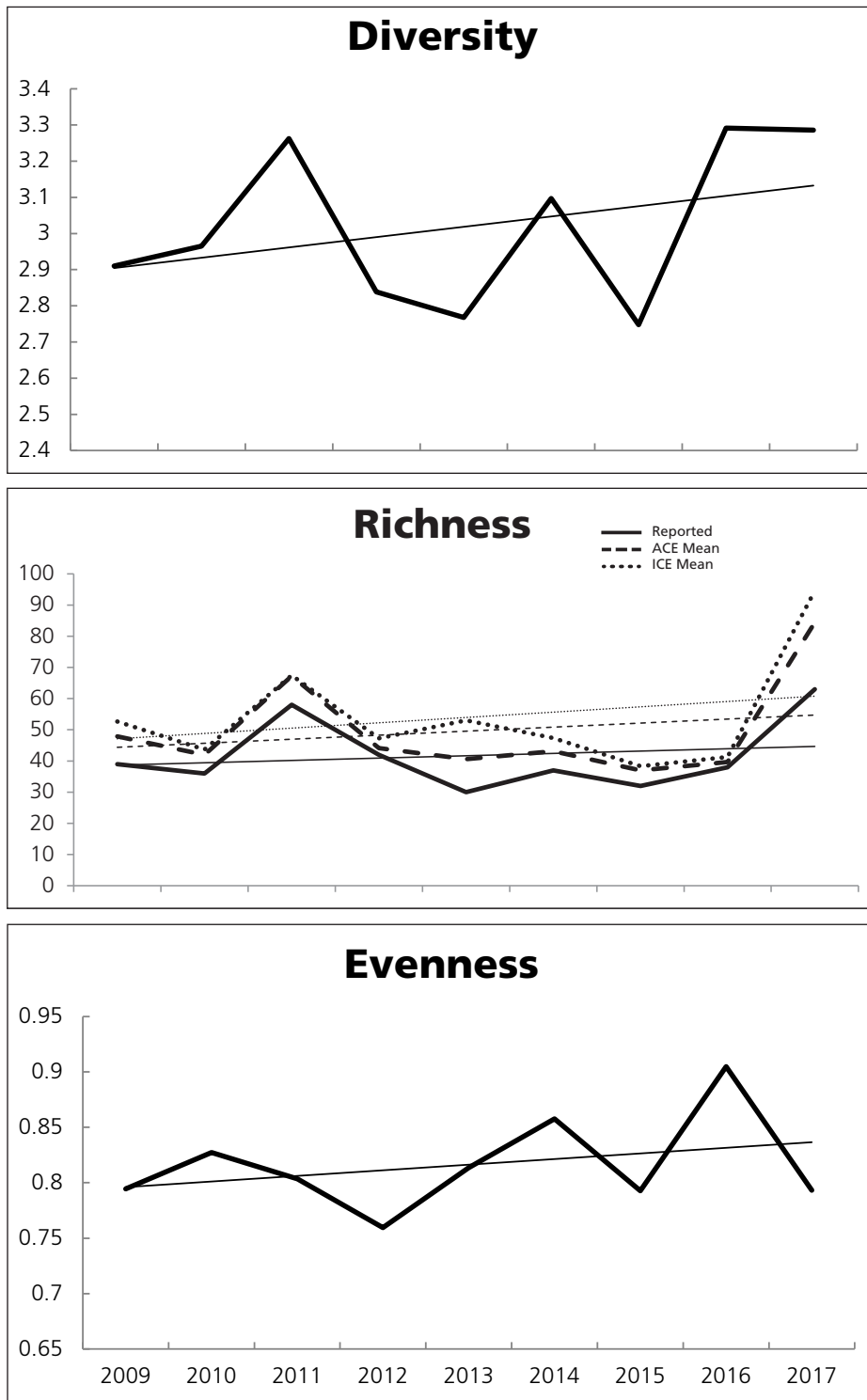


Figure 4. Trends in bird community diversity, richness, and species distribution evenness on Pipestone National Monument, Minnesota, from 2009 through 2017.

Discussion

Breeding bird surveys were initiated at Pipestone National Monument in 2009 to assist the park in assessing the integrity of their grasslands and woodlands through time. During the nine years of monitoring, 92 bird species have been recorded. Eighty are permanent or summer residents to the area (Janssen et al. 2003). Therefore, these 80 species have some value in characterizing the park's breeding bird community and their habitat.

The six breeding species of concern for the Prairie Potholes Bird Conservation Region should be given additional consideration when managing natural resources on the park: Black Tern (*Chlidonias niger*), Dickcissel (*Spiza americana*), Grasshopper Sparrow (*Ammodramus savannarum*), Least Bittern (*Ixobrychus exilis*), Swainson's Hawk (*Buteo swainsoni*), and Upland Sandpiper (*Bartramia longicauda*). Two of these species happen to be recorded in sufficient numbers to calculate population trends: Dickcissel and Grasshopper Sparrow. These two species require open prairie and or weedy field habitat, the main habitat type in the park. If it is not feasible to manage habitat for the four remaining species of conservation concern directly, then at least habitat should be managed in a way that does not conflict with their needs. Habitat requirements for the Swainson's Hawk and Upland Sandpiper are similar to habitat requirements of the Dickcissel and Grasshopper Sparrow, making it easier to manage for these four species as a group. But, the Black Tern and Least Bittern require wet meadows, marshes with dense vegetation, and pond habitat that is quite different from the requirements of the other four species, making management for them a little more complex.

Twelve breeding species were observed during the survey period in sufficient numbers to calculate annual abundances and trends with some degree of confidence. The Bobolink (*Dolichonyx oryzivorus*), Clay-colored Sparrow (*Spizella pallida*), and Common Grackle (*Quiscalus quiscula*) were the most abundant and widespread species on Pipestone National Monument and provide for the best characterization of habitat present. The Bobolink utilizes grasslands, Clay-colored Sparrow occupies brushy areas often near water, and Common Grackle uses open areas with some trees (Stokes and Stokes 1996). Habitat on the park is primarily open grasslands and

prairie with an element of Bur Oak and Northern Ash – Elm woodlands, and thick herbaceous vegetation along a stream corridor (Diamond et al. 2014), habitat that is well suited for the three common and wide spread species. As suggested by Pashley and Barrow (1993), the mix of habitat (structural composition) on the park is important for the species of regional concern since they have varying microhabitat requirements.

Comparing population trends on Pipestone National Monument with regional trends for the Prairie Potholes Bird Conservation Region were inconclusive, but suggest that many of the park's bird populations are faring similar to or better than populations found region-wide. While we were unable to detect with certainty either positive or negative population trends for six of the twelve species that we calculated abundance and trends for on the park, the six remaining species had populations that were increasing in numbers. None of the species with sufficient numbers to calculate trends had a population in decline on the park. However, only three of the species with positive population trends on the park had positive regional trends, and one species with an uncertain trend on the park had a region-wide positive trend. The Common Yellowthroat (*Geothlypis trichas*), with a strong population increase on the park, had a declining population region-wide, and the seven remaining species had uncertain population trends region-wide.



Common Grackle (*Quiscalus quiscula*). NPS

Over the nine years of bird monitoring on Pipestone National Monument, the unchanging diversity, richness, and evenness in distribution of individuals across species values suggest habitat on the park has remained similar across years (Figure 3), and provides for an array of breeding species (average of 42 species annually). However, this stable species community structure could be altered if significant portions of the parks prairies and grasslands were converted to woodlands or invaded by shrubby vegetation.

Our reported data are a baseline for placing bird populations at the park into the context of those seen in the larger Prairie Potholes Bird Conservation Region, and should help the park make 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.).

Literature Cited

- Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press. 432 pp.
- Cairns Jr., J., P. V. McCormick and B. R. Niederlehner. 2004. A proposed framework for developing indicators of ecosystem health. *Hydrobiologia* 263:1-44.
- Colwell, R. K. 2013. EstimateS: Statistical estimation of species richness and shared species from samples. Version 9. User's Guide and application published at <http://purl.oclc.org/estimates>.
- Diamond, D. D., L. F. Elliott, M. D. DeBacker, K. M. James, D. L. Pursell, and A. Struckhoff. 2014. Vegetation mapping and classification of Pipestone National Monument, Minnesota: Project report. Natural Resource Report NPS/PIPE/NRR—2014/802. National Park Service, Fort Collins, Colorado.
- Fancy, S. G. 1997. A new approach for analyzing bird densities from variable circular plot counts. *Pacific Science* 51:107-114.
- Gregory R. D, J. Reif, L. Fornasari, I. J. Burfield, P. Chylarecki, A. Van Strien, P. Vorisek, F. D. R. Jiguet, A. W. Gmelig Meyling. 2007. Population trends of widespread woodland birds in Europe. *Ibis* 149:78-97.
- Integrated Taxonomic Information System (ITIS). 2017. Integrated taxonomic information system (ITIS) on-line database. Available at <https://www.itis.gov/> (accessed 26 July 2017).
- Janssen, R. B., D. D. Tessen, and G. Kennedy. 2003. Birds of Minnesota and Wisconsin. Lone Pine Publishing, Auburn, Washington. 376 pp.
- Karr, J. R. 1991. Biological integrity: a long-neglected aspect of water resource management. *Ecological Applications* 1:66-84.
- Mallory, M. L., H. G. Gilchrist, B. M. Braune and A. J. Gaston. 2006. Marine birds as indicators of arctic marine ecosystem health: linking the northern ecosystem initiative to long-term studies. *Environmental Monitoring and Assessment* 113:31-48.
- Maurer, B. A. 1993. Biological diversity, ecological integrity, and neotropical migrants: New perspectives for wildlife managers. Pages 24-31 in D.M. Finch and P.W. Stangel, eds., Status and management of neotropical migratory birds. U.S. Forest Service General Technical Report RM-229.
- North American Bird Conservation Initiative (NABCI). 2012. North American Bird Conservation Initiative web site. Available at <http://www.nabci-us.org/about.htm> (accessed 8 November 2012).
- Pannekoek J., and A. J. van Strien. 2005. TRIM 3 manual (Trends and Indices for Monitoring data). Statistics Netherlands, Voorburg, The Netherlands.
- Pashley, D. N., and W. C. Barrow. 1993. Effects of land use practices on neotropical migratory birds in bottomland hardwood forests. Pages 315-320 in D.M. Finch and P.W. Stangel, eds., Status and management of neotropical migratory birds. U.S. Forest Service General Technical Report RM-229.
- Peitz, D. G., G. A. Rowell, J. L. Haack, K. M. James, L. W. Morrison, and M. D. Debacker. 2008. Breeding bird monitoring protocol for the Heartland Network Inventory and Monitoring Program. Natural Resource Report NPS/HTLN/NRR-2008/044. National Park Service, Fort Collins, Colorado.
- Peitz, D. G. 2010. Bird community monitoring at Pipestone National Monument, Minnesota: 2009 status report. Natural Resource Data Series NPS/HTLN/NRDS—2010/045. National Park Service, Fort Collins, Colorado.
- Pielou, E. C. 1969. An introduction to mathematical ecology. John Wiley and Sons, New York, New York. 286pp.

- Reese, G. C., K. R. Wilson, and C. H. Flather. 2014. Performance of species richness estimators across assemblage types and survey parameters. *Global Ecology and Biogeography* 23: 585-594.
- Sauer, J. R., D. K. Niven, J. E. Hines, D. J. Ziolkowski, Jr, K. L. Pardieck, J. E. Fallon, and W. A. Link. 2017. The North American breeding bird survey, results and analysis 1966 - 2015. Version 2.07.2017 USGS Patuxent Wildlife Research Center, Laurel, MD. Available at <https://www.mbr-pwrc.usgs.gov/bbs/> (accessed 25 August 2017).
- Shannon, C. E. 1949. The mathematical theory of communication. University of Illinois Press, Urbana, Illinois. 177 pp.
- Stokes, D. W., and L. Q. Stokes. 1996. Stokes field guide to birds: Eastern region. Little, Brown and Company, New York, New York.
- U.S. Fish and Wildlife Service (USFWS). 2008. Birds of conservation concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Online version available at <http://www.fws.gov/migratorybirds/>.
- Van Strien, A. J., J. Pannekoek, and D. W. Gibbons. 2001. Indexing European bird population trends using results of national monitoring schemes: a trial of a new method. *Bird Study* 48:200-213.
- Walther, B. A., and J. L. Moore. 2005. The concepts of bias, precision and accuracy, and their use in testing the performance of species richness estimators, with a literature review of estimator performance. *Ecography*, 28:815-829.
- Wood, J. K., N. Nur, C. A. Howell, and G. R. Geupel. 2006. Overview of Cosumnes riparian bird study and recommendations for monitoring and management. A Report to the California Bay-Delta Authority Ecosystem Restoration Program. Petaluma, California. 18pp.

Appendix A. Plots Sampled

Table A1. Plots sampled on Pipestone National Monument, Minnesota, between 2009 and 2017 and gross habitat type. “Yes” indicates plot was sampled; “No” indicates it was not.

Plot	Year sampled									Plot type
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
PIPE 1	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 2	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 3*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 4	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 5*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 6	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 7	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 8	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 9	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Woodland/Shrubland
PIPE 10	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 11*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 12	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 13*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 14	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 15*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 16	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 17	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 18	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Woodland/Shrubland
PIPE 19	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 20	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 21	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 22	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 23*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 24	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie

* Plots included in the analysis of individual bird species trends (also in bold).

Table A1 (continued). Plots sampled on Pipestone National Monument, Minnesota, between 2009 and 2017 and gross habitat type. “Yes” indicates plot was sampled; “No” indicates it was not.

Plot	Year sampled									Plot type	
	2009	2010	2011	2012	2013	2014	2015	2016	2017		
PIPE 25*	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Woodland/Shrubland
PIPE 26	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 27*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 28	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Woodland/Shrubland	
PIPE 29*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 30	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 31	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 32	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 33	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Woodland/Shrubland	
PIPE 34	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 35	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 36	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 37*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 38	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 39	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 40*	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Woodland/Shrubland
PIPE 41	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 42	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 43	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 44	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 45	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 46	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 47*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 48	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 49	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie	
PIPE 50*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie

* Plots included in the analysis of individual bird species trends (also in bold).

Table A1 (continued). Plots sampled on Pipestone National Monument, Minnesota, between 2009 and 2017 and gross habitat type. “Yes” indicates plot was sampled; “No” indicates it was not.

Plot	Year sampled									Plot type
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
PIPE 51	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 52	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 53	Yes	Yes	Yes	Yes	No	No	No	No	Ywa	Grassland/Prairie
PIPE 54	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Woodland/Shrubland
PIPE 55	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 56*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 57	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 58*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 59	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 60	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 61	Yes	Yes	Yes	No	No	No	No	No	Yes	Grassland/Prairie
PIPE 62	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 63	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 64*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 65	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 66*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grassland/Prairie
PIPE 67	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie
PIPE 68	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Grassland/Prairie

*Plots included in the analysis of individual bird species trends (also in bold).

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

Table B1. Annual proportion of plots occupied by each breeding bird species, and estimated abundance (determined using Distance software) of each species at Pipestone National Monument, Minnesota, during the 2009 to 2017 spring bird surveys (n = number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance using Distance does not.

Common name	Proportion of plots occupied (Abundance)								
	2009 n=44	2010 n=47	2011 n=44	2012 n=43	2013 n=9	2014 n=9	2015 n=9	2016 n=8	2017 n=44
American Goldfinch	0.24 (21)	0.36 (40)	0.60 (22)	0.40 (34)	0.06 (7)	0.59 (35)	0.41 (28)	0.65 (57)	0.59 (55)
American Robin	0.28 (39)	0.42 (36)	0.56 (20)	0.40 (40)	0.29 (32)	0.76 (52)	0.47 (65)	0.41 (19)	0.47 (84)
Bobolink	0.44 (91)	0.37 (74)	0.65 (58)	0.49 (79)	0.71 (102)	0.35 (38)	0.71 (159)	0.65 (121)	0.37 (57)
Brown-headed Cowbird	0.27 (41)	0.10 (32)	0.27 (22)	0.19 (35)	0.24 (38)	0.53 (38)	0.24 (50)	0.29 (25)	0.40 (66)
Clay-colored Sparrow	0.18 (28)	0 (0)	0.03 (6)	0.19 (27)	0.06 (8)	0.71 (16)	0.76 (291)	0.65 (16)	0.40 (77)
Common Grackle	0.47 (29)	0.67 (49)	0.78 (19)	0.76 (29)	0.29 (0)	0.71 (26)	0.77 (179)	0.71 (26)	0.44 (6)
Common Yellowthroat	.02 (1)	0.05 (4)	0.37 (3)	0.28 (29)	0.06 (5)	0.35 (0)	0.65 (102)	0.53 (11)	0.41 (51)
Dickcissel*	0.03 (6)	0 (0)	0.19 (17)	0.51 (127)	0.06 (11)	0 (0)	0.24 (66)	0.12 (22)	0.03 (6)
Grasshopper Sparrow*	0.19 (28)	0.27 (50)	0.62 (17)	0.15 (26)	0.24 (42)	0.18 (17)	0.47 (110)	0.53 (0)	0.15 (21)
Red-winged Blackbird	0.22 (19)	0.21 (17)	0.38 (12)	0.31 (21)	0.24 (14)	0.59 (32)	0.53 (40)	0.59 (14)	0.49 (25)
Ring-necked Pheasant	0.26 (7)	0.09 (3)	0.35 (1)	0.22 (7)	0.53 (17)	0.53 (1)	0.59 (19)	0.59 (1)	0.40 (14)
Song Sparrow	0.01 (1)	0.12 (8)	0.18 (3)	0.06 (3)	0 (0)	0.29 (4)	0.47 (38)	0.47 (11)	0.35 (38)

*Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

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

Table C1. 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 Pipestone National Monument, Minnesota, during the 2009 to 2017 spring bird surveys (n=number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when a species was present, but outside of 50 m from the plot center, and therefore their annual abundance value could not be calculated.

Common name	Proportion of plots occupied (Abundance)								
	2009 n=68	2010 n=67	2011 n=68	2012 n=67	2013 n=17	2014 n=17	2015 n=17	2016 n=17	2017 n=68
American Crow	0.04 (–)	0.09 (–)	0.32 (4)	0.04 (–)	0.12 (–)	0.18 (–)	0.29 (–)	0.18 (–)	0.18 (–)
American Redstart	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (–)	0 (0)	0.02 (–)
Baltimore Oriole	0 (0)	0.05 (2)	0.04 (4)	0.13 (7)	0.12 (9)	0.06 (–)	0 (0)	0 (0)	0.04 (–)
Bank Swallow	0.04 (–)	0 (–)	0 (–)	0 (–)	0.06 (–)	0.12 (–)	0 (–)	0.12 (–)	0 (–)
Barn Swallow	0.03 (–)	0.19 (11)	0.21 (9)	0.15 (–)	0.06 (–)	0.24 (–)	0.41 (–)	0.12 (–)	0.18 (–)
Belted Kingfisher	0.01 (–)	0.03 (–)	0.03 (–)	0.01 (–)	0 (0)	0.06 (–)	0 (0)	0.12 (–)	0.01 (–)
Black and White Warbler	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.01 (2)
Black-capped Chickadee	0 (0)	0 (0)	0 (0)	0.05 (7)	0 (0)	0.06 (–)	0 (0)	0 (0)	0.02 (–)
Black Tern*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.01 (–)
Blue Jay	0 (0)	0 (0)	0.07 (–)	0.03 (4)	0 (0)	0 (0)	0 (0)	0.12 (9)	0 (0)
Blue-gray Gnatcatcher	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (2)
Blue Grosbeak	0 (0)	0 (0)	0.01 (–)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.03 (2)

*Species considered of regional concern for the Central Mixed Grass Bird Conservation Region (USFWS 2008; also in bold).

Table C1 (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 Pipestone National Monument, Minnesota, during the 2009 to 2017 spring bird surveys (n=number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “–” denotes when a species was present, but outside of 50 m from the plot center, and therefore their annual abundance value could not be calculated.

Common name	Proportion of plots occupied (Abundance)								
	2009 n=68	2010 n=67	2011 n=68	2012 n=67	2013 n=17	2014 n=17	2015 n=17	2016 n=17	2017 n=68
Blue-winged Teal	0 (0)	0 (0)	0.03 (–)	0.03 (–)	0 (0)	0 (0)	0 (0)	0 (0)	0.03 (–)
Brown Thrasher	0.06 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (9)	0 (0)	0 (0)	0 (0)
Canada Goose	0.18 (–)	0.02 (–)	0.19 (2)	0 (0)	0.35 (43)	0 (0)	0 (0)	0.24 (–)	0.27 (6)
Cedar Waxwing	0.02 (–)	0 (0)	0.06 (–)	0.02 (26)	0 (0)	0 (0)	0.06 (–)	0 (0)	0 (0)
Chimney Swift	0 (0)	0 (0)	0.07 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chipping Sparrow	0 (0)	0.01 (4)	0.31 (4)	0.03 (4)	0.06 (9)	0.24 (–)	0.06 (–)	0 (0)	0.03 (–)
Common Nighthawk	0 (0)	0.09 (4)	0.19 (–)	0 (0)	0 (0)	0 (0)	0.06 (9)	0.06 (9)	0.03 (–)
Cooper’s Hawk	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (–)
Double-crested Cormorant	0.02 (–)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Downy Woodpecker	0 (0)	0.04 (7)	0.03 (–)	0 (0)	0 (0)	0.06 (17)	0 (0)	0 (0)	0 (0)
Eastern Kingbird	0.03 (–)	0.07 (2)	0.15 (11)	0.07 (11)	0 (0)	0.18 (34)	0.41 (86)	0.12 (–)	0.06 (2)
Eastern Meadowlark	0.02 (–)	0.02 (2)	0.04 (–)	0.03 (–)	0.12 (9)	0 (0)	0.12 (–)	0.06 (–)	0.12 (2)
Eastern Phoebe	0 (0)	0 (0)	0.04 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (9)	0.03 (–)
Eastern Towhee	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (9)	0 (0)	0 (0)	0 (0)	0 (0)
European Starling	0 (0)	0.01 (2)	0.16 (2)	0.06 (4)	0 (0)	0.06 (–)	0 (0)	0.12 (–)	0.01 (4)

*Species considered of regional concern for the Central Mixed Grass Bird Conservation Region (USFWS 2008; also in bold).

Table C1 (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 Pipestone National Monument, Minnesota, during the 2009 to 2017 spring bird surveys (n=number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “-” denotes when a species was present, but outside of 50 m from the plot center, and therefore their annual abundance value could not be calculated.

Common name	Proportion of plots occupied (Abundance)								
	2009 n=68	2010 n=67	2011 n=68	2012 n=67	2013 n=17	2014 n=17	2015 n=17	2016 n=17	2017 n=68
Field Sparrow	0.15 (17)	0.18 (11)	0.31 (15)	0.09 (7)	0.06 (-)	0 (0)	0.24 (-)	0.24 (9)	0.07 (4)
Gray Catbird	0.03 (2)	0.05 (4)	0.06 (2)	0 (0)	0 (0)	0.06 (-)	0.06 (-)	0.06 (-)	0.04 (4)
Great Blue Heron	0.02 (-)	0.02 (2)	0 (0)	0.02 (-)	0 (0)	0.06 (-)	0 (0)	0.12 (-)	0.09 (-)
Great Crested Flycatcher	0 (0)	0 (0)	0.01 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Heron	0 (0)	0 (0)	0.02 (-)	0.03 (-)	0 (0)	0 (0)	0.06 (-)	0 (0)	0 (0)
Hairy Woodpecker	0 (0)	0 (0)	0.03 (-)	0 (0)	0 (0)	0.06 (-)	0 (0)	0 (0)	0 (0)
Henslow's Sparrow	0 (0)	0 (0)	0 (0)	0.01 (2)	0 (0)	0 (0)	0.12 (26)	0 (0)	0 (0)
Horned Lark	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (2)
House Finch	0 (0)	0.01 (0)	0.01 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
House Sparrow	0 (0)	0.02 (-)	0.02 (-)	0 (0)	0.06 (-)	0 (0)	0 (0)	0 (0)	0 (0)
House Wren	0.03 (4)	0.07 (4)	0.31 (4)	0.06 (9)	0.06 (-)	0.12 (-)	0.12 (9)	0.18 (-)	0.06 (4)
Killdeer	0.03 (2)	0.02 (9)	0.10 (-)	0.05 (2)	0.18 (-)	0.35 (26)	0 (0)	0.18 (-)	0.03 (-)
Least Bittern*	0 (0)	0 (0)	0.01 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Least Flycatcher	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.03 (4)
Mallard	0.03 (-)	0.09 (-)	0.07 (2)	0.03 (-)	0 (0)	0.12 (-)	0 (0)	0.24 (9)	0.16 (-)

*Species considered of regional concern for the Central Mixed Grass Bird Conservation Region (USFWS 2008; also in bold).

Table C1 (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 Pipestone National Monument, Minnesota, during the 2009 to 2017 spring bird surveys (n=number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “-” denotes when a species was present, but outside of 50 m from the plot center, and therefore their annual abundance value could not be calculated.

Common name	Proportion of plots occupied (Abundance)								
	2009 n=68	2010 n=67	2011 n=68	2012 n=67	2013 n=17	2014 n=17	2015 n=17	2016 n=17	2017 n=68
Marsh Wren	0 (0)	0 (0)	0 (0)	0 (0)	0.24 (9)	0 (0)	0 (0)	0 (0)	0.03 (2)
Mourning Dove	0.09 (-)	0.22 (-)	0.34 (2)	0.12 (7)	0.06 (-)	0.12 (-)	0.24 (9)	0.24 (-)	0.10 (-)
Northern Flicker	0.01 (-)	0.06 (2)	0.03 (-)	0.04 (2)	0 (0)	0.06 (-)	0.12 (-)	0 (0)	0.03 (-)
Northern Harrier	0.02 (-)	0.02 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.03 (-)
Northern Rough-winged Swallow	0.06 (-)	0 (0)	0.12 (4)	0.05 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (-)
Northern Shoveler	0.06 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (-)
Orchard Oriole	0 (0)	0 (0)	0.07 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (2)
Red-tailed Hawk	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (-)	0 (0)	0.03 (-)
Rock Dove	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (-)	0 (0)	0 (0)	0 (0)	0 (0)
Ruby-throated Hummingbird	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (-)	0 (0)	0 (-)
Savannah Sparrow	0 (0)	0.06 (7)	0.01 (2)	0.03 (4)	0.59 (51)	0.12 (9)	0.18 (0)	0.24 (17)	0.01 (-)
Sedge Wren	0.03 (6)	0 (0)	0.02 (2)	0.22 (22)	0 (0)	0.24 (9)	0.12 (0)	0.29 (9)	0.24 (26)
Sora	0 (0)	0 (0)	0.03 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Swainson's Hawk*	0 (0)	0 (0)	0 (0)	0.02 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Species considered of regional concern for the Central Mixed Grass Bird Conservation Region (USFWS 2008; also in bold).

Table C1 (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 Pipestone National Monument, Minnesota, during the 2009 to 2017 spring bird surveys (n=number of plots sampled). Note that the proportion of plots occupied includes flyovers, whereas estimated abundance does not. “-” denotes when a species was present, but outside of 50 m from the plot center, and therefore their annual abundance value could not be calculated.

Common name	Proportion of plots occupied (Abundance)								
	2009 n=68	2010 n=67	2011 n=68	2012 n=67	2013 n=17	2014 n=17	2015 n=17	2016 n=17	2017 n=68
Tree Swallow	0.09 (-)	0.16 (4)	0.28 (4)	0.15 (4)	0.06 (-)	0.18 (-)	0 (0)	0.29 (90)	0.03 (-0)
Turkey Vulture	0 (0)	0.02 (-)	0.07 (-)	0 (0)	0 (0)	0.06 (-)	0 (0)	0.18 (-)	0.07 (-)
Upland Sandpiper*	0.02 (-)	0 (0)	0.02 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vesper Sparrow	0 (0)	0 (0)	0.01 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Warbling Vireo	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (2)
Western Kingbird	0 (0)	0 (0)	0.02 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Western Meadowlark	0.06 (4)	0.18 (15)	0 (0)	0.06 (-)	0 (0)	0.18 (-)	0 (0)	0 (0)	0.01 (-)
Wild Turkey	0 (0)	0 (0)	0.06 (-)	0.05 (-)	0 (0)	0.18 (26)	0 (0)	0.12 (-0)	0.03 (-)
Willow Flycatcher	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.01 (-)
Wood Duck	0 (0)	0 (0)	0.03 (-)	0 (0)	0.06 (-)	0 (0)	0 (0)	0.06 (-)	0.03 (-)
Yellow Warbler	0.02 (4)	0 (0)	0.07 (2)	0.02 (7)	0.18 (26)	0.35 (0)	0.18 (9)	0.18 (-)	0.16 (21)
Yellow-headed Blackbird	0 (0)	0 (0)	0.03 (-)	0.01 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Yellow-rumped Warbler	0.01 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Yellow-throated Vireo	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.01 (-)

*Species considered of regional concern for the Central Mixed Grass Bird Conservation Region (USFWS 2008; also in bold).

Appendix D. Pipestone National Monument Trends

Table D1. Trends, annual change in abundance (individuals), of breeding birds recorded on Pipestone National Monument, Minnesota, from 2009 through 2017. "-" denotes species with unreliable trend estimates.

Common name	Trend ^A	SE of slope	Trend Classification ^B
American Goldfinch	1.09	0.04	Moderate Increase
American Robin	1.12	0.04	Moderate Increase
Bobolink	1.09	0.03	Moderate Increase
Brown-headed Cowbird	1.09	0.10	Uncertain
Clay-colored Sparrow	1.64	1.54	uncertain
Common Grackle	1.12	0.06	Moderate Increase
Common Yellowthroat	1.29	0.08	Strong Increase
Dickcissel	1.03	0.06	Uncertain
Grasshopper Sparrow	1.09	0.09	Uncertain
Red-winged Blackbird	1.03	0.04	Uncertain
Ring-necked Pheasant	1.20	0.08	Strong Increase
Song Sparrow	-	-	-

^A Trends were determined using the statistical software TRIM Version 3.54 (2006).

^B Trend classification types depending on statistical significance and magnitude (Pannekoek and van Strien 2005; Van Strien et al. 2001), and following 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: lower limit of confidence interval > 1.05. Moderate increase – significant increase, but not significantly more than 5% per year. Criterion: 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: 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: 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: 0.95 < upper limit of confidence interval < 1.00. Steep decline – decline significantly more than 5% per year. Criterion: upper limit of confidence interval < 0.95.

Appendix E. Regional Trends

Table E1. Regional trends (Prairie Potholes Bird Conservation Region) in breeding birds recorded on Pipestone National Monument, Minnesota, from 2005 through 2015. Regional trend data from the BBS surveys (Sauer et al. 2017). "NA" signifies that few observations of the species were made, so calculations of trends could not be made.

Common name	95% Confidence Interval		
	Trend	Lower	Upper
American Crow	-2.23	-3.17	-1.27
American Goldfinch	3.89	2.54	5.34
American Restart	4.09	1.46	7.13
American Robin	4.26	3.53	5.00
Baltimore Oriole	1.29	-0.13	2.85
Bank Swallow	-0.54	-3.33	3.98
Barn Swallow	-0.11	-1.12	0.97
Belted Kingfisher	0.50	-3.65	4.35
Black and White Warbler	5.87	1.47	11.54
Black-capped Chickadee	1.02	-1.57	3.75
Black Tern*	4.50	-1.62	10.95
Blue Jay	-2.16	-4.18	-0.25
Blue-gray Gnatcatcher	NA	NA	NA
Blue Grosbeak	3.36	-0.84	10.23
Blue-winged Teal	4.88	1.06	9.03
Bobolink	-0.90	-2.54	0.60
Brown Thrasher	-1.23	-2.56	0.12
Brown-headed Cowbird	0.61	-0.42	1.71
Canada Goose	9.92	5.29	14.68
Cedar Waxwing	5.22	1.47	9.02
Chimney Swift	-1.66	-5.90	2.34
Chipping Sparrow	1.71	0.33	2.92
Clay-colored Sparrow	0.41	-0.63	1.49
Common Grackle	1.80	0.64	3.06
Common Nighthawk	1.95	-0.39	5.01
Common Yellowthroat	-0.96	-1.80	-0.10
Cooper's Hawk	2.62	-2.78	8.02
Dickcissel	-0.06	-3.55	3.49
Double-crested Cormorant	4.43	-2.88	11.82
Downy Woodpecker	1.97	-0.13	4.28
Eastern Kingbird	-0.38	-1.49	0.75
Eastern Phoebe	3.35	0.20	7.32
Eastern Towhee	1.48	-6.95	9.62
European Starling	-2.47	-4.03	-0.97

* Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

Table E1 (continued). Regional trends (Prairie Potholes Bird Conservation Region) in breeding birds recorded on Pipestone National Monument, Minnesota, from 2005 through 2015. Regional trend data from the BBS surveys (Sauer et al. 2017). "NA" signifies that few observations of the species were made, so calculations of trends could not be made.

Common name	95% Confidence Interval		
	Trend	Lower	Upper
Field Sparrow	4.82	1.51	8.04
Grasshopper Sparrow*	-0.41	-2.74	1.81
Gray Catbird	1.42	0.25	2.73
Great Blue Heron	1.20	-2.01	4.45
Great Crested Flycatcher	0.97	-1.17	3.12
Green Heron	3.46	-3.72	19.45
Hairy Woodpecker	2.07	0.01	4.28
Henslow's Sparrow	NA	NA	NA
Horned Lark	-4.16	-5.48	-2.82
House Finch	3.80	-2.84	10.54
House Sparrow	-3.97	-5.24	-2.76
House Wren	1.63	0.69	2.60
Killdeer	0.28	-0.67	1.22
Least Bittern*	31.95	1.53	85.31
Least Flycatcher	1.49	0.36	2.63
Mallard	1.88	-0.23	4.38
Marsh Wren	2.22	-1.36	5.76
Mourning Dove	0.99	0.10	1.95
Northern Flicker	-2.24	-3.70	-0.73
Northern Harrier	-1.69	-3.43	-0.17
Northern Rough-winged Swallow	4.82	-1.47	16.11
Northern Shoveler	2.42	-2.00	7.11
Orchard Oriole	2.05	0.06	3.92
Red-tailed Hawk	0.65	-0.96	2.15
Red-winged Blackbird	1.42	0.49	2.36
Ring-necked Pheasant	1.29	-1.48	4.09
Rock Dove	0.20	-1.45	1.66
Savannah Sparrow	-0.14	-1.07	0.73
Sedge Wren	-4.91	-7.99	-1.90
Song Sparrow	-0.16	-1.13	0.83
Sora	2.95	-0.21	6.21
Swainson's Hawk*	0.06	-1.18	1.32
Tennessee Warbler	0.41	-7.63	9.41
Tree Swallow	2.34	0.79	3.93
Turkey Vulture	14.27	4.38	24.73
Upland Sandpiper	1.09	-0.28	2.63

* Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

Table E1 (continued). Regional trends (Prairie Potholes Bird Conservation Region) in breeding birds recorded on Pipestone National Monument, Minnesota, from 2005 through 2015. Regional trend data from the BBS surveys (Sauer et al. 2017). "NA" signifies that few observations of the species were made, so calculations of trends could not be made.

Common name	95% Confidence Interval		
	Trend	Lower	Upper
Vesper Sparrow	-0.04	-0.93	0.88
Warbling Vireo	4.14	2.59	5.98
Western Kingbird	-0.98	-2.63	0.67
Western Meadowlark	-1.23	-2.01	-0.48
Wild Turkey	11.45	3.94	17.36
Willow Flycatcher	0.73	-1.95	3.34
Wood Duck	4.53	0.15	8.78
Yellow Warbler	2.35	1.19	3.66
Yellow-headed Blackbird	2.60	-0.36	5.84
Yellow-rumped Warbler	-2.99	-10.68	4.74
Yellow-throated Vireo	6.48	2.36	10.72

* Species considered of regional concern for the Prairie Potholes Bird Conservation Region (USFWS 2008; also in bold).

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
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