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The Influence of Local- and Landscape-Level Factors on Wetland Breeding Birds in the Prairie Pothole Region of North and South Dakota

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Cover. An adult male Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) perching on emergent vegetation (cattails) in a natural, semipermanent wetland on privately owned land in Day County, South Dakota. Photograph by Lawrence D. Igl (U.S. Geological Survey).

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Conversion Factors

International System of Units to U.S. customary units

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
	Area	
hectare (ha)	2.471	acre
hectare (ha)	0.003861	square mile (mi^2)
square kilometer (km^2)	0.3861	square mile (mi^2)
	Flow rate	
kilometer per hour (km/h)	0.6214	mile per hour (mi/h)

Datum

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).
Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Abbreviations

AIC_C	Akaike's Information Criteria for small sample sizes
ΔAIC_C	the difference between the model with the lowest AIC_C and each subsequent model
ANCOVA	analysis of covariance
EMAP	Environmental Monitoring and Assessment Program
EV	percentage of the wetland in emergent vegetation
*Grass*800	percentage of grassland area within 800 meters
HAPET	Habitat and Population Evaluation Team
*Numwet*800	number of wetlands within 800 meters
NWI	National Wetlands Inventory
OW	percentage of the wetland in open water
p-value	probability value
R^2	coefficient of determination
USFWS	U.S. Fish and Wildlife Service
w	Akaike weight
*Wetland*800	percentage wetland area within 800 meters
WM	percentage of the wetland in wet meadow
WMD	Wetland Management District

The Influence of Local- and Landscape-Level Factors on Wetland Breeding Birds in the Prairie Pothole Region of North and South Dakota

By Lawrence D. Igl, Jill A. Shaffer, Douglas H. Johnson, and Deborah A. Buhl

Abstract

We examined the relationship between local- (wetland) and landscape-level factors and breeding bird abundances on 1,190 depressional wetlands in the Prairie Pothole Region of North and South Dakota during the breeding seasons in 1995–97. The surveyed wetlands were selected from five wetland classes (alkali, permanent, semipermanent, seasonal, or temporary), two wetland types (natural or restored), and two landowner groups (private or Federal). We recorded 133 species of birds in the surveyed wetlands during the 3 years. We analyzed the nine most common (or focal) species (that is, species that were present in 25 percent or more of the 1,190 wetlands): the Red-winged Blackbird (*Agelaius phoeniceus*), Blue-winged Teal (*Anas discors*), Mallard (*Anas platyrhynchos*), American Coot (*Fulica americana*), Gadwall (*Anas strepera*), Common Yellowthroat (*Geothlypis trichas*), Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), Northern Shoveler (*Anas clypeata*), and Savannah Sparrow (*Passerculus sandwichensis*). Our results emphasize the ecological value of all wetland classes, natural and restored wetlands, and publicly and privately owned wetlands in this region, including wetlands that are generally smaller and shallower (that is, temporary and seasonal wetlands) and thus most vulnerable to drainage. Blue-winged Teal, Northern Shoveler, Gadwall, Common Yellowthroat, and Red-winged Blackbird had higher abundances on Federal than on private wetlands. Abundances differed among wetland classes for seven of the nine focal species: Blue-winged Teal, Northern Shoveler, Mallard, American Coot, Common Yellowthroat, Yellow-headed Blackbird, Red-winged Blackbird. American Coot had higher abundances on restored wetlands than on natural wetlands overall, and Gadwall and Common Yellowthroat had higher abundances on private restored wetlands than on private natural wetlands. The Common Yellowthroat was the only species that had higher abundances on restored private wetlands than on restored Federal wetlands. After adjusting for wetland size and the date and location of the surveys, our results demonstrated that incorporating wetland- and landscape-level factors in models can improve our ability to predict abundances of wetland birds in this region. The top model for eight of the nine focal species included wetland- and landscape-level factors, whereas the best model for Blue-winged Teal included only wetland-level attributes. Although local factors (for example, percent open water or emergent vegetation) in individual wetlands are important factors for some wetland breeding birds, it is important that natural resource managers consider landscape-level factors beyond the local factors in their conservation plans for wetland birds.

Introduction

Wetlands are among the most productive and diverse natural ecosystems in the world (Whittaker and Likens, 1973; Gibbs, 1993; Sebastián-González and Green, 2016). They currently occupy about 5–8 percent of the Earth's surface (Mitsch and Gosselink, 2000) and 5.5 percent of the conterminous United States (Dahl, 2014). Wetlands provide numerous ecosystem services including carbon storage, shoreline stabilization, groundwater recharge, water purification, flood and erosion control, nutrient retention, food production, and fish and wildlife habitat (Gleason and others, 2008; Mushet, 2016).

The Prairie Pothole Region of North America is a biologically diverse and unique wetland-grassland ecosystem (Baldassarre and Bolen, 2006). The prairie potholes, or depressional wetlands, in this region contain water for various lengths of time within a year (Kantrud and others, 1989a, 1989b). Size, hydrology, water chemistry, plant associations, and invertebrate communities vary widely among wetlands and, within a wetland, through time (Kantrud and others, 1989a, 1989b). Most wetlands in this region are less than (<) 0.5 hectare (ha) in size, and wetland density in some areas of the Prairie Pothole Region may exceed 40 wetlands per square kilometer (km^2) (Kantrud and others, 1989a; Johnson and others, 1997).

The Prairie Pothole Region is considered one the most intensively managed agricultural areas in the United States (Peterson and others, 1997; Higgins and others, 2002), primarily because of its productive soils and the ease with which this landscape can be altered (Hoekstra and others, 2005; Doherty and others, 2013). As such, wetland drainage and degradation in the Prairie Pothole Region have been extensive; the area of wetlands in the Prairie Pothole Region has declined by nearly 61 percent since settlement (Dahl, 2014). The Prairie Pothole Region currently contains about 5.8 percent of the total area of wetlands in the conterminous United States (Dahl, 2014). In 2009, there were an estimated 2,602,166 ha of wetland habitat in the Prairie Pothole Region in the United States, representing 6.7 percent of the total surface area of the region. Wetlands make up 9 and 8.5 percent of the surface area in the Prairie Pothole Region of North and South Dakota (fig. 1), respectively (Dahl, 2014).

Despite losses and degradation of wetlands in this region, as well as losses of adjacent native grasslands (Higgins and others, 2002; Stephens and others, 2008; Rashford and others, 2011; Doherty and others, 2013), the Prairie Pothole Region remains an area of high ecological importance. The wetlands in this region are critically important for breeding and migrating waterfowl and other wetland-dependent birds (Peterson and others, 1997; Beyersbergen and others, 2004; Baldassarre and Bolen, 2006; Skagen and Thompson, 2013). The Prairie Pothole Region supports more than 50 percent of the continent's breeding population of eight species of ducks; nearly 70 percent of the continental population of Franklin's Gull (*Leucophaeus pipixcan*); more than 50 percent of the continental populations of Pied-billed Grebe (*Podilymbus podiceps*), American Bittern (*Botaurus lentiginosus*), Sora (*Porzana carolina*), American Coot (*Fulica americana*), and Black Tern (*Chlidonia niger*); and about 30 percent of the continental populations of American White Pelican (*Pelecanus erythrorhynchos*) and California Gull (*Larus californicus*) (Batt and others, 1989; Beyersbergen and others, 2004; Niemuth and others, 2008). Several wetland bird species in this region have been listed as species of high conservation concern in the Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen and others, 2004), in several State Wildlife Action Plans in the northern Great Plains (for example, South Dakota: South Dakota Department of Game, Fish and Parks, 2014; North Dakota: Dyke and others, 2015), and by the U.S. Fish and Wildlife Service (USFWS) in the Prairie Pothole Region (USFWS, 2008).

There is a continued need for information on the habitat requirements at local (wetland) and landscape levels for all wetland birds in the Prairie Pothole Region (Beyersbergen and others, 2004). In 1995, we began a 3-year study of wetland birds using depressional wetlands in the Prairie Pothole Region of North and South Dakota (fig. 1). The surveyed wetlands were selected from five wetland classes (alkali, permanent, semipermanent, seasonal, or temporary; Stewart and Kantrud, 1971), two wetland types (restored or natural), and two landowner groups (private or Federal land; also referred to as owners or landowners). The objective of this study was to examine the relationship between wetland- and landscape-level factors and breeding bird abundance in wetlands in the Prairie Pothole Region in North and South Dakota. The full dataset used for analyses can be found in Igl and others (2017).

Study Area—The Prairie Pothole Region, North and South Dakota

This study was conducted in the Prairie Pothole Region of North and South Dakota (fig. 1). The Prairie Pothole Region in these two States lies east and north of the Missouri River. This formerly glaciated landscape is characterized by numerous wetlands (Cowardin and others, 1979; Bluemle, 2000), ranging from wet meadows, fens, and seasonal wetlands to permanent alkali or freshwater lakes (Stewart and Kantrud, 1971; Cowardin and others, 1979). Agriculture is the primary land use in the Dakotas, with cropland being the dominant land cover in the eastern Dakotas and rangeland increasing westward (Niemuth and others, 2010). Precipitation in this region can be highly variable from 1 year to the next; for example, the period between 1988 and mid-1993 was the second driest period in North Dakota during the 20th century, whereas the period between mid-1993 and 1999 (that is, during this study) may have been the wettest period in North Dakota during the past 130–500 years (Williams-Sether and others, 1994; Williams-Sether, 1999; Winter and Rosenberry, 1998; National Oceanic and Atmospheric Administration, 2017).

Natural and restored wetlands were identified and located on private lands and on Federal National Wildlife Refuges and Waterfowl Production Areas managed by the USFWS. In 1995, bird surveys were restricted to wetlands in North Dakota; additional wetlands from North and South Dakota were added in 1996 and 1997. The following USFWS Wetland Management Districts (WMDs) were included in this study: Arrowwood WMD (1995–97), Audubon WMD (1996–97), Chase Lake WMD (1995–97), Des Lacs WMD (1995–96), Devils Lake WMD (1995–97), J. Clark Salyer WMD (1996–97), Kulm WMD (1995–96), Long Lake WMD (1995–97), Lostwood WMD (1995–97), Tewaukon WMD (1996–97), and Valley City WMD (1995–96) in North Dakota; and Huron WMD (1996–97), Lake Andes WMD (1997), Madison WMD (1997), Sand Lake WMD (1996–97), and Waubay WMD (1996–97) in South Dakota (fig. 1).

Initially, in 1995, we selected some focal wetlands on private and Federal lands within 40-km^2 hexagons that were established in the region by the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (EMAP) to monitor wetland condition (Kantrud and Newton, 1996; Peterson and others, 1997), and later used in the mid-1990s by several studies conducted by the U.S. Geological Survey Northern Prairie Wildlife Research Center's Grasslands Ecosystem Initiative (Johnson and Batie, 2001; Browder and others, 2002; this study). For wetlands on Federal lands, field personnel visited individual WMD offices of the USFWS to identify Waterfowl Production Areas and National Wildlife Refuge lands that contained a range of wetland sizes in five wetland classes (alkali, permanent,

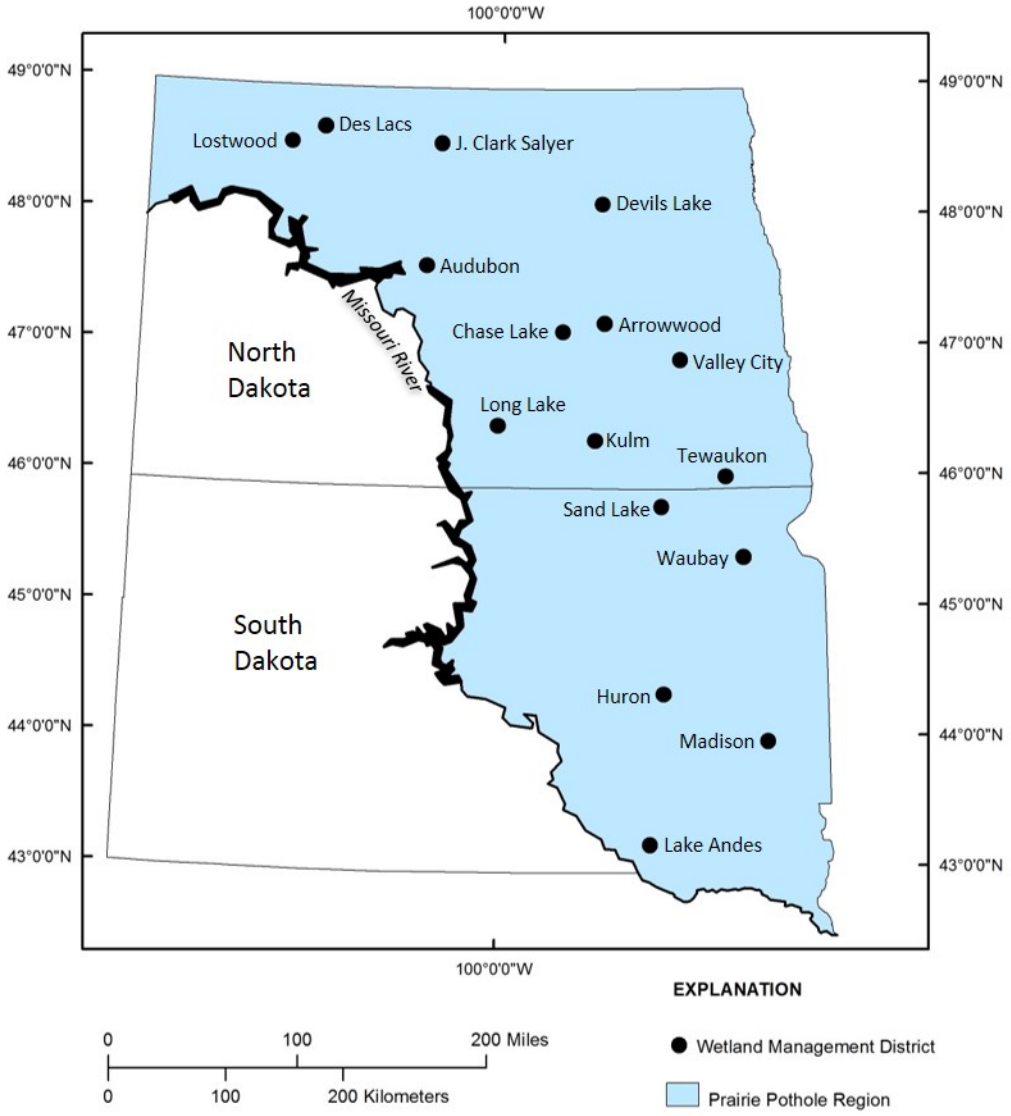

Figure 1. Headquarter locations for 16 Wetland Management Districts of the U.S. Fish and Wildlife Service in the Prairie Pothole Region of North and South Dakota in 1995–97.

semipermanent, seasonal, and temporary) as defined by Stewart and Kantrud (1971). During the visits to WMD offices, field personnel also obtained information and locations of wetlands on privately or federally owned lands that had been previously drained or cultivated and later restored. We selected wetlands that had been restored several years before this study because they afforded more mature cover and thus a better perspective on wetland- and landscape-level effects rather than transient effects related to the number of years after restoration (VanRees-Siewert and Dinsmore, 1996). Several tilled wetlands (that is, wetlands that are farmed during

dry periods) were surveyed in 2 of the 3 years, but they were excluded from the analyses because of small sample sizes. Created wetlands were not included in this study. We obtained written permission from private landowners or operators to survey breeding birds on their wetlands and secured special-use permits from the USFWS to conduct bird surveys on Federal lands.

Methods for Wetland Breeding Bird Surveys

Total-area counts of breeding birds in wetlands were conducted in 1995–97 using a minor modification of the survey methods for wetland birds described by Stewart and Kantrud (1972) and Igl and Johnson (1997). Before conducting field work, observers were trained in wetland classification (Stewart and Kantrud, 1971; Harold A. Kantrud, U.S. Geological Survey, oral commun.) and regional bird identification (aural and visual). We surveyed breeding birds from early May to early July in each year, which coincides with the peak breeding season of wetland breeding birds in the Prairie Pothole Region (Stewart and Kantrud, 1972; Stewart, 1975; Kantrud and Stewart, 1984; Igl and Johnson, 1997). Breeding birds were surveyed between one-half hour before sunrise and the midday lull in bird activity in wetlands, which varies from day to day but usually occurs in the early afternoon in this region (about 1400 Central Standard Time). We avoided surveying birds in adverse weather conditions (for example, heavy precipitation or sustained winds stronger than 40 kilometers per hour), although surveying during light drizzle or misting on calm days was allowed if birds were still active. Stewart and Kantrud (1972) and Igl and Johnson (1997) used less restrictive standards related to wind speed in open habitats (for example, grasslands and wetlands) to provide observers with more time and dates to complete bird surveys in this region. Other researchers also have used less restrictive standards for bird surveys in prairie regions (Robbins and others, 1986; Martin and others, 1997).

The study sites included a wide range of wetland sizes. Small wetlands usually were surveyed by a single observer; large wetlands typically were surveyed simultaneously by two observers, each surveying about one-half of the wetland. Large or wide-ranging birds (for example, raptors, herons, and waterfowl) that flushed from the wetland upon an observer's arrival at the focal wetland were recorded as being within the wetland. Following Stewart and Kantrud's (1972) recommendations, species (for example, raptors, waterfowl, herons, grebes, and coots) on open water that were likely to fly or seek cover upon closer approach were counted from the shoreline or a high vantage point before entering a wetland. Birds using emergent vegetation and the shoreline or mudflat were surveyed while walking the wetland perimeter. In narrow zones of emergent vegetation, the observer attempted to flush large species (for example, ducks and herons) and secretive species (for example, rails and bitterns) by wading through the wetland vegetation. In large zones of emergent vegetation, the observer waded in a zigzag course throughout the wetland. In wetlands that were surveyed by two observers, observers compared field notes at the end of the survey to prevent duplication in the counts.

Taped calls of seven secretive marsh bird species were broadcast during the survey of a wetland to elicit responses (Delphey and Dinsmore, 1993; Gibbs and Melvin, 1993; Ribic and others, 1999). The broadcast tape was 5 minutes in length and included common calls, 26–50 seconds in length, of each focal species. The order of the species on the tape was as follows: Sora, Yellow Rail (*Coturnicops noveboracensis*), Virginia Rail (*Rallus limicola*), American Coot, Pied-billed Grebe, American Bittern, and Least Bittern (*Ixobrychus exilis*). The broadcast calls were played once at small wetlands and multiple times at larger wetlands, such that the entire wetland was covered. After the calls were broadcast, the observers remained briefly at the location of the broadcast to record any responses by the focal species.

Counts of birds were based primarily on the number of indicated breeding pairs on territories or home ranges or by the presence of active nests. For most species, nearly all indicated pairs were observed as territorial males or as segregated pairs. In the case of wide-ranging or colonial-nesting species that are not sexually dimorphic or dichromatic (for example, shorebirds, coots, grebes, and swallows), one or two individuals were considered to represent a pair, but if more than two individuals were observed on a wetland, the total number of indicated pairs was derived by halving the total number of individuals counted and rounding up to the nearest whole pair. For the polyandrous Wilson's Phalarope (*Phalaropus tricolor*), segregated pairs and lone females were recorded as indicated pairs. For the polygynous Red-winged (*Agelaius phoeniceus*) and Yellow-headed (*Xanthocephalus xanthocephalus*) blackbirds, the number of breeding pairs was based on the number of males and represented, in terms of breeding mates, a minimum population. For the brood parasitic Brown-headed Cowbird (*Molothrus ater*), we based the number of indicated pairs on the total number of females. Birds that were flying overhead were counted only if their flight originated or terminated in the wetland, their attempt to alight in the wetland was deterred because of the presence of an observer, or they were using the wetland while in flight, such as for flycatching or hunting, courtship or communal displaying, and so on.

The procedures used to determine the number of pairs of breeding waterfowl followed Hammond (1969). In general, single pairs, lone males of dabblers or divers, and lone females of diving ducks were considered as an indicated pair. Occasionally, the number of lone female ducks on a wetland exceeded the number of males unaccompanied by females. In this case, each excess lone female was considered to represent a pair.

We did not consider certain birds observed during the surveys to be using the wetlands and excluded them from our results. These included wide-ranging colonial waterbirds (for example, pelicans, cormorants, egrets, and herons) passing high overhead, and other birds passing overhead in high, direct flight. Juveniles were recorded but not considered part of the breeding population at a site; however, a single adult or a pair of adults accompanied by a one or more juveniles was counted as a single pair. In total, 20 observed pairs (about 0.05 percent of total breeding pairs observed) were not identified to the species level and were excluded from analyses and in summary statistics. Vernacular and scientific names follow the checklist of the American Ornithologists' Union (1998) and subsequent supplements. Scientific names and four-letter alpha codes for all species observed during this study are included in appendix tables 1–1 and 1–2, respectively.

Some wetlands, including those in EMAP hexagons, were surveyed in more than 1 year. For each wetland surveyed, the size of the wetland was estimated primarily by field personnel, although some wetland sizes were obtained from the U.S. Geological Survey's Northern Prairie Wildlife Research Center as part of the U.S. Environmental Protection Agency's EMAP effort, or determined from the USFWS's National Wetlands Inventory (NWI) database (Wilen and Bates, 1995). During field work in each year, field personnel also estimated the percentage cover of major wetland zones (Stewart and Kantrud, 1971; Cowardin and others, 1979) for each wetland. The number of wetland zones and the definitions of some wetland zones changed among years, which resulted in some wetland zones being collapsed into a broader category before statistical analyses. The final four wetland zones included open water, emergent vegetation (for example, cattail [*Typha* spp.], bulrush [Cyperaceae], flooded shrubs [for example, *Salix* spp.]), wet meadow (for example, fine-textured grasses [Poaceae], rushes [Juncaceae], and

sedges [Cyperaceae]), and shoreline/mudflat. Each breeding pair was recorded as present within one of these four wetland zones (see appendix table 1–4).

To evaluate the effects of landscape variables on wetland bird abundance, we identified the location of the surveyed wetlands in the NWI database (Wilen and Bates, 1995). Delineated wetlands in the NWI database were converted to individual depressional wetlands by dissolving arcs and classifying the wetland by the most permanent water regime, using techniques described by Cowardin and others (1995) and Johnson and Higgins (1997). Wetlands were then classified as alkali, permanent, semipermanent, seasonal, or temporary, using the wetland classification system and terminology developed by Stewart and Kantrud (1971).

Upland habitats in the landscape surrounding the surveyed wetlands were classified by the USFWS's Habitat and Population Evaluation Team (HAPET) using Landsat Thematic Mapper imagery (https://lta.cr.usgs.gov/TM) into four major categories: agriculture (that is, row crop, small grains, and fallow), undisturbed grasses (for example, Conservation Reserve Program grasslands and dense nesting cover), mature forest, and native grasses and scattered low shrubs. We also determined the number of disjunct wetlands and the number of wetland water regimes (temporary, seasonal, semipermanent, permanent, riverine, and unmapped), using information from the NWI database. We sampled landscape habitat at three scales using a circular moving-window analysis, which summarizes data within a window of a selected size around each 30×30-meter (m) cell in a Geographical Information System data layer (Niemuth and others, 2008). The landscape data were in raster format, and the area within each moving window was about 48, 191, and 452 ha, respectively, for circles with radii about 400, 800, and 1,200 m.

Data Analysis to Assess the Influence of Local- and Landscape-Level Factors

Data from the wetland bird surveys were analyzed to assess the relationship of wetland- and landscape-level factors with abundance of wetland bird species. As mentioned above, the surveyed wetlands were selected from five wetland classes (alkali, permanent, semipermanent, seasonal, or temporary; Stewart and Kantrud, 1971), two wetland types (natural or restored), and two landowner groups (private or Federal land). Some wetlands were surveyed in multiple years, but it was not always clear which wetlands were surveyed multiple times across years. This was, in part, due to the heavy precipitation preceding and during the survey period (Williams-Sether and others, 1994; Williams-Sether, 1999; Winter and Rosenberry, 1998) that resulted in rapid changes in size and classification of individual wetlands, as well as the amalgamation of multiple smaller wetlands into a single larger wetland (for example, see Igl, 2004). For the purpose of our analyses, each wetland in each year was considered a unique wetland, giving a total of 1,291 wetlands surveyed.

Each wetland was surveyed either once or twice within a year; most wetlands were surveyed only once. For those wetlands that were surveyed twice, only the second survey was used in the analyses. During each survey, the number of indicated pairs for each species present was recorded within each wetland zone of the wetland; however, because the number of zones and their definitions changed across years, the number of pairs by zone was not used in the analyses; rather, the total number of pairs of each species within the wetland was computed and used as the response variable in the analyses.

In addition to wetland class, type, and owner, several wetland-level (for example, wetland size, percent of wetland in various zones, percent of wetland with water, and location) and

landscape-level (that is, surrounding cover) explanatory variables were measured for each wetland. Landscape-level explanatory variables obtained from HAPET for the area within 400, 800, and 1,200 m of each wetland included the percent of the area within various cover types and the number of wetlands, but were only available for 1,190 of the 1,291 wetlands. Based on the range of values within variables, correlations among variables, completeness of data, and expert opinion, the pool of explanatory variables was reduced down to the variables listed in table 1. For each landscape-level explanatory variable within 400, 800, and 1200 m of each wetland, the measurements at one scale were highly correlated with the measurements at the other two scales; therefore, only one scale for the landscape variables was retained for analyses. We chose the 800-m scale because it would likely identify the landscape that wetland birds perceive near the focal wetlands (Niemuth and others, 2006). Percentage of grassland and percentage of agricultural land within the landscape were very highly correlated ($r = –0.88$), so only the percentage of grassland within 800 m was retained. Given that we lacked landscape-level data for some surveyed wetlands (including all wetlands in Audubon, Chase Lake, Des Lacs, and Valley City WMDs in 1995; and all wetlands in Arrowwood WMD in 1996; fig. 1), the final set of data used for analyses only included 1,190 wetlands (fig. 2).

Analysis of covariance (ANCOVA; Milliken and Johnson, 2002) methods were used to test for differences in the number of breeding bird pairs for each species among wetland classes, types, owners, and their interactions while adjusting for wetland size (which was natural logarithm transformed), date of survey (Julian date), and location of wetland (easting and northing). Date of survey was included in the ANCOVA because peak breeding periods vary among wetland bird species (Stewart and Kantrud, 1972; Igl and Johnson, 1997). Easting and northing were rescaled to improve numerical stability and convergence of models (table 1). For all covariates, a common slope was assumed across all levels of wetland class, type, and owner. The ANCOVAs were completed using PROC GLIMMIX of SAS® (SAS Institute, 2015) with the number of breeding pairs as the response variable and by specifying a negative binomial error distribution with a log link function (Hilbe, 2011). This analysis was completed for the nine most common bird species observed (that is, species that occurred in 25 percent or more of the 1,190 wetlands); in order of abundance, these were the Red-winged Blackbird, Blue-winged Teal (*Anas discors*), Mallard (*Anas platyrhynchos*), American Coot, Gadwall (*Anas strepera*), Common Yellowthroat (*Geothlypis trichas*), Yellow-headed Blackbird, Northern Shoveler (*Anas clypeata*), and Savannah Sparrow (*Passerculus sandwichensis*). For the latter three species, there were one or two combinations of wetland class, type, and owner at which no breeding pairs were observed (table 2); therefore, for these three species the three-way interaction term was not included in the model (table 3). Least squares means were computed for all main effects and for interaction terms with probability values (p-values) <0.05. Differences in least squares were tested using Fisher's least significant differences (Milliken and Johnson, 2002); two least squares means were interpreted as significantly different if the p-value was <0.05. Only significant findings were reported for tests using Fisher's least significant differences.

An information theoretic approach was used to compare 18 candidate models to assess the relationship between the number of indicated breeding pairs and the wetland- and landscape-level variables for the nine focal species. For each species, candidate models were constructed by first including the variables deemed significant (that is, p-value<0.05) from the previous ANCOVA for that species; however, if a main effect and an interaction effect involving that variable were both significant, only the interaction effect was included in these models. Then

Table 1. Summary of wetland- and landscape-level explanatory variables used in statistical analyses to model abundance of breeding birds in wetlands within the Prairie Pothole Region of North and South Dakota in 1995–97.

Variable	Description	Mean	Standard error	Minimum	Median	Maximum
	Wetland-level variables					
Class	Wetland class (alkali, permanent, semipermanent, seasonal, or temporary)			Categorical variable		
Wtype	Wetland type (natural or restored)			Categorical variable		
Owner	Landowner group (private or Federal)			Categorical variable		
Lsize	Log-transformed (natural logarithm) wetland size (hectares)	–0.333	0.050	–4.605	–0.693	5.319
Juldate	Julian date of survey	165.987	0.334	138	166	184
East	Rescaled easting (rescaled as [easting – minimum(easting)]/1,000)	323.429	3.003	0	315.087	508.529
North	Rescaled northing (rescaled as [northing – minimum(northing)]/1,000)	358.634	4.493	0	331.936	653.666
OW	Percentage of the wetland in open water	37.382	0.912	0	30	100
EV[a]	Percentage of the wetland in emergent vegetation	24.844	0.808	0	15	100
WM[a]	Percentage of the wetland in wet meadow	33.628	0.957	0	20	100
	Landscape-level variables					
*Grass*800	Percentage grassland area within 800 meters	56.311	0.655	0	60	97
*Wetland*800	Percentage wetland area within 800 meters	14.441	0.287	0	13	82
*Numwet*800	Number of wetlands within 800 meters	27.518	0.385	1	25	75
	Summary statistics for wetland size, easting, and northing in original scale					
Size	Wetland size (hectares)	4.022	0.364	0.010	0.500	204.260
Easting	Easting	510,678	3,003	187,248	502,335	695,777
Northing	Northing	5,132,419	4,493	4,773,785	5,105,721	5,427,451

[a]*EV* was used as an explanatory variable in the analyses to model abundance for all species except Savannah Sparrow, for which *WM* was used instead.

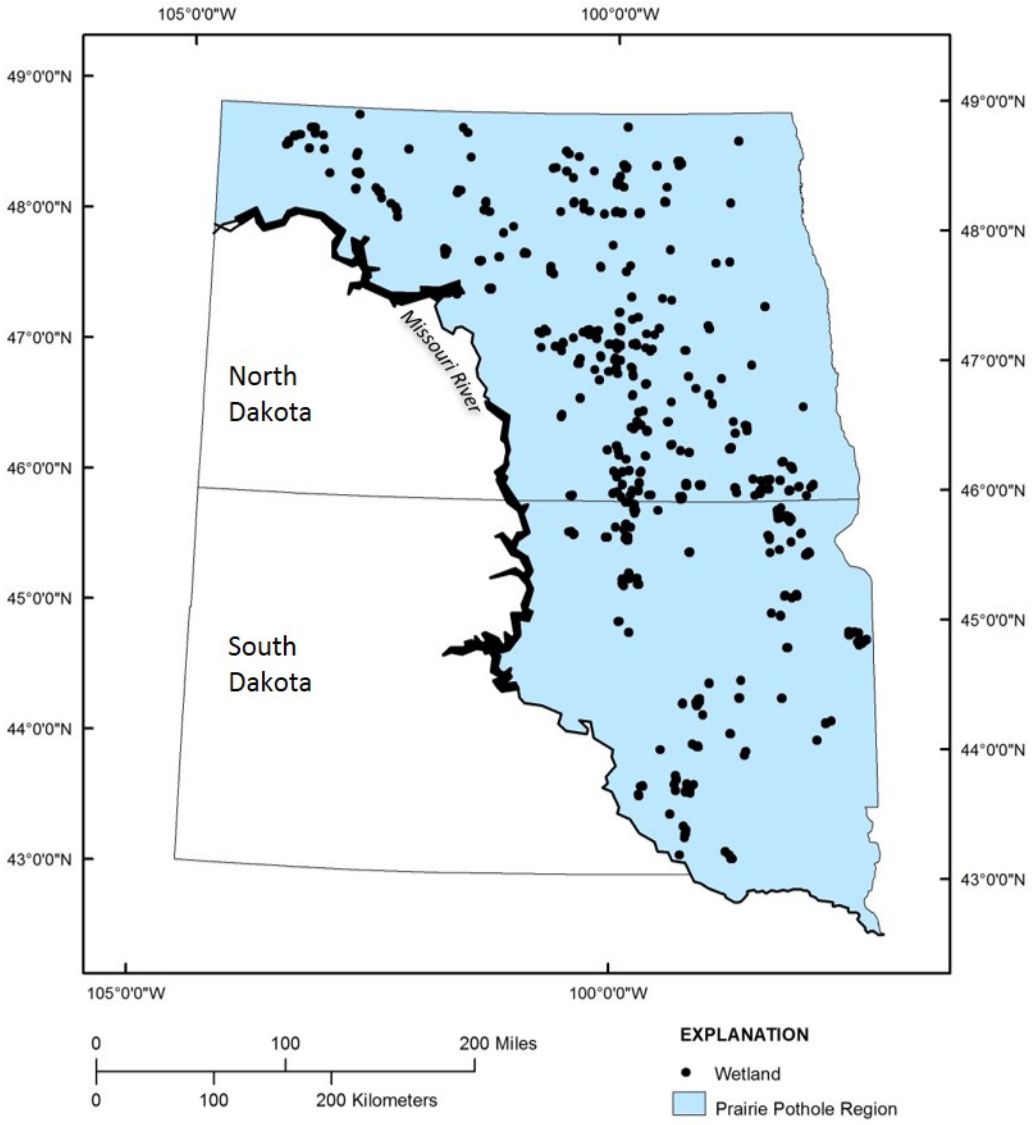

Figure 2. Distribution of 1,190 wetlands that were surveyed to evaluate the association of wetland- and landscape-level factors with wetland bird abundances in the Prairie Pothole Region of North and South Dakota in 1995–97. Clusters of wetlands reflect their associations with U.S. Fish and Wildlife Service's Wetland Management Districts (fig. 1).

added to those variables were the percentage of the wetland in open water (*OW*), percentage of the wetland in emergent vegetation (*EV*; for all species but Savannah Sparrow), percentage of the wetland in wet meadow (*WM*; for Savannah Sparrow only), percentage of grassland area within

800 m (*Grass*800), percentage of wetland area within 800 m (*Wetland*800), and the number of wetlands within 800 m (*Numwet*800) (table 1). These variables were added alone and in combination (additive effects only; no interactions were included) while avoiding the inclusion of two variables that are part of a group of variables that add up to 100 percent (for example, *OW* and *EV* [or *WM*] were not included in same model, and *Grass*800 and *Wetland*800 were not included in the same model). The 18 candidate models were:

1. Significant variables from ANCOVA
2. Significant variables from ANCOVA + *OW*
3. Significant variables from ANCOVA + *EV* (or *WM*)
4. Significant variables from ANCOVA + *Grass*800
5. Significant variables from ANCOVA + *Wetland*800
6. Significant variables from ANCOVA + *Numwet*800
7. Significant variables from ANCOVA + *Grass800* + *Numwet*800
8. Significant variables from ANCOVA + *Wetland*800 + *Numwet*800
9. Significant variables from ANCOVA + *OW* + *Grass*800
10. Significant variables from ANCOVA + *OW* + *Wetland*800
11. Significant variables from ANCOVA + *OW* + *Numwet*800
12. Significant variables from ANCOVA + *OW* + *Grass*800 + *Numwet*800
13. Significant variables from ANCOVA + *OW* + *Wetland*800 + *Numwet*800
14. Significant variables from ANCOVA + *EV* (or *WM*) + *Grass*800
15. Significant variables from ANCOVA + *EV* (or *WM*) + *Wetland*800
16. Significant variables from ANCOVA + *EV* (or *WM*) + *Numwet*800
17. Significant variables from ANCOVA + *EV* (or *WM*) + *Grass*800 + *Numwet*800
18. Significant variables from ANCOVA + *EV* (or *WM*) + *Wetland*800 + *Numwet*800

Akaike's Information Criteria for small sample sizes (AIC_C), the difference between the model with the lowest AIC_C and each subsequent model (ΔAIC_C), and the Akaike weight (w; the relative likelihood of each model) were computed for each model (Burnham and Anderson, 2002). The coefficient of determination (R^2), which indicates the percentage of variation in the data explained by the model, is not appropriate for count data (Hilbe, 2011); therefore, pseudo-R^2 values were computed instead. These pseudo-R^2 cannot be interpreted as one would interpret a R^2, but low pseudo-R^2 values would indicate a poor model fit whereas high values would indicate a good model fit. Plots of observed versus predicted values were constructed to assess model fit.

For all species observed, a variety of summary statistics were computed, including the total number of breeding pairs observed, the proportion of wetlands observed overall and by levels of categorical variables, and summary statistics for the wetland and landscape variables for all wetlands and for wetlands used by each species. Two wetland and landscape variables that were not included in the above analyses were included in these summaries: percentage of the wetland in shoreline/mudflat and percentage of agriculture within 800 m.

General Results

Between May 18 and July 3, 1995–97, 37,075 indicated breeding pairs of 133 bird species were recorded on 1,190 wetlands, which included 5 wetland classes, 2 wetland types, and 2 landowner groups. Wetland size ranged from 0.01 ha to greater than 200 ha and had a mean

Table 2. Number of wetlands surveyed within each combination of wetland class, wetland type, and landowner group; and total number of pairs observed within each combination for nine focal species in the Prairie Pothole Region of North and South Dakota in 1995–97.

[RWBL, Red-winged Blackbird; BWTE, Blue-winged Teal; MALL, Mallard; AMCO, American Coot; GADW, Gadwall; COYE, Common Yellowthroat; YHBL, Yellow-headed Blackbird; NSHO, Northern Shoveler; SAVS, Savannah Sparrow]

Wetland class	Wetland type	Landowner group	Number of wetlands surveyed	Number of breeding pairs observed								
				RWBL	BWTE	MALL	AMCO	GADW	COYE	YHBL	NSHO	SAVS
Alkali	Natural	Private	10	14	45	33	35	34	1	21	22	8
		Federal	27	140	281	115	140	181	11	166	118	73
	Restored	Private	3	6	16	2	8	7	5	5	3	1
		Federal	4	8	27	7	12	32	1	0	21	1
Permanent	Natural	Private	8	25	56	14	56	33	9	69	3	2
		Federal	33	392	427	194	474	248	71	638	60	34
	Restored	Private	2	4	10	15	16	31	7	14	0	5
		Federal	4	22	44	31	22	25	8	59	6	0
Semipermanent	Natural	Private	98	314	235	103	240	98	97	290	41	43
		Federal	228	1028	962	524	821	458	437	1877	112	84
	Restored	Private	154	478	467	220	248	158	257	465	73	61
		Federal	44	173	193	92	84	73	72	257	54	26
Seasonal	Natural	Private	100	196	293	78	147	78	19	48	70	32
		Federal	146	454	520	218	313	246	132	330	93	36
	Restored	Private	141	352	402	168	150	141	104	80	79	62
		Federal	23	50	56	21	34	16	24	105	13	14
Temporary	Natural	Private	55	41	35	14	17	9	5	16	10	15
		Federal	59	117	84	31	41	47	25	12	24	17
	Restored	Private	39	23	18	7	1	11	11	2	4	19
		Federal	12	18	10	3	2	6	10	0	6	3

(plus or minus [±] standard error) of 4.022±0.364 (table 1; appendix table 1–3). In total, 75 percent of the wetlands were 2.1 ha or smaller.

The 9 most abundant bird species (6.7 percent of the 133 species detected) occurred in 25 percent or more of the 1,190 wetlands (table 2; appendix table 1–1). We recorded 1,000 or more breeding pairs for 10 (7.5 percent) species, and fewer than 5 pairs for 37 (27.8 percent) species (appendix table 1–1). The list of 133 species included 15 species that typically do not breed in North or South Dakota, including late-arriving spring migrants (for example, Canada Warbler [*Cardellina canadensis*]), vagrants that are outside of their typical breeding range (for example, White Ibis [*Eudocimus albus*]; Marlow and others, 1996), and some shorebirds and waterfowl that breed in the tundra and boreal regions of northern North America but may oversummer in the northern Great Plains (for example, Least Sandpiper [*Calidris minutilla*] and Snow Goose [*Chen caerulescens*]). Despite the use of broadcast calls for the Yellow Rail, the species was not recorded at any of the 1,190 wetlands during the 3 years of this study. Summary statistics for wetlands and all bird species are provided in appendix tables 1–1 through 1–4.

Results from the Analysis of Covariance

The number of breeding pairs was positively related to wetland size for all nine focal species (fig. 3), whereas the results for the other three covariates varied with species (table 3). A significant negative relationship was observed with date of survey for Red-winged Blackbird, Blue-winged Teal, American Coot, Yellow-headed Blackbird, and Northern Shoveler (fig. 4). Blue-winged Teal, Mallard, American Coot, Gadwall, and Northern Shoveler displayed a significant negative relationship between the number of pairs and easting, and one species (Common Yellowthroat) showed a significant positive relationship between the number of pairs and easting (table 3). The results for northing were similar; five species (Red-winged Blackbird, Blue-winged Teal, Mallard, Gadwall, and Common Yellowthroat) exhibited a significant negative relationship between the number of breeding pairs and northing, and one species (Savannah Sparrow) exhibited a significant positive relationship between the number of pairs and northing (table 3).

The number of pairs observed differed among wetland classes for seven of the nine species (table 3; fig. 3). Blue-winged Teal were significantly less abundant on temporary wetlands than all other wetland classes and were significantly more abundant on seasonal than semipermanent wetlands (fig. 3). The number of Mallards was significantly lower on temporary wetlands than on permanent, semipermanent, and seasonal wetlands. American Coots were significantly less abundant on alkali and temporary wetlands than on permanent, semipermanent, and seasonal wetlands. Alkali wetlands had significantly lower numbers of Common Yellowthroat pairs than permanent and semipermanent wetlands, and semipermanent wetlands had significantly higher numbers than seasonal and temporary wetlands. The Yellow-headed Blackbird was significantly less abundant on temporary wetlands than all other wetland classes, significantly less abundant on seasonal wetlands than on permanent and semipermanent wetlands, and significantly less abundant on alkali wetlands than semipermanent wetlands. Seasonal wetlands had significantly higher numbers of Northern Shoveler pairs than permanent, semipermanent, and temporary wetlands; and semipermanent wetlands had significantly higher numbers than permanent wetlands. For Red-winged Blackbird, class differences depended on the wetland owner. Temporary private wetlands had significantly fewer Red-winged Blackbird pairs than private seasonal and semipermanent wetlands; and semipermanent Federal wetlands had significantly more pairs than seasonal and alkali Federal wetlands.

Table 3. Results from the analysis of covariance models to assess the effects of wetland class, wetland type, and landowner group on the number of breeding pairs of nine focal species, while accounting for wetland size, date of survey, and wetland location (easting and northing) in the Prairie Pothole Region of North and South Dakota in 1995–97.

[Numerator degrees of freedom for *F*-tests equal 4 for *Class*, *Class*Wtype*, *Class*Owner*, and *Class*Wtype*Owner*; and equal 1 for *Wtype*, *Owner*, *Wtype*Owner*, and all covariates. Denominator degrees of freedom for *F*-tests equal 1,166 for the first six species and equal 1,170 for the last three species (denominator degrees of freedom are higher for these three species because the three-way interaction was not included). RWBL, Red-winged Blackbird; BWTE, Blue-winged Teal; MALL, Mallard; AMCO, American Coot; GADW, Gadwall; COYE, Common Yellowthroat; YHBL, Yellow-headed Blackbird; NSHO, Northern Shoveler; SAVS, Savannah Sparrow; *Class*, wetland class (alkali, permanent, semipermanent, seasonal, or temporary); *F*, *F*-distribution statistic; *P*, *p*-value (probability); <, less than; *Wtype*, wetland type (natural or restored); *, interaction; *Owner*, landowner group (private or Federal); ---, no record; *Lsize*, log-transformed (natural logarithm) wetland size; *Juldate*, Julian date of survey; *East*, rescaled easting; *North*, rescaled northing]

Variable (table 1)	RWBL	BWTE	MALL	AMCO	GADW	COYE	YHBL	NSHO	SAVS
Class	*F*=5.19, *P*=0.0004	*F*=8.30, *P*<0.0001	*F*=4.17, *P*=0.0023	*F*=10.16, *P*<0.0001	*F*=1.88, *P*=0.1123	*F*=7.45, *P*<0.0001	*F*=28.55, *P*<0.0001	*F*=5.02, *P*=0.0005	*F*=0.61, *P*=0.6564
Wtype	*F*=0.44, *P*=0.5080	*F*=0.07, *P*=0.7878	*F*=0.41, *P*=0.5226	*F*=4.49, *P*=0.0343	*F*=3.71, *P*=0.0543	*F*=18.21, *P*<0.0001	*F*=0.61, *P*=0.4334	*F*=0.02, *P*=0.9015	*F*=0.11, *P*=0.7426
*Class*Wtype*	*F*=1.63, *P*=0.1643	*F*=2.25, *P*=0.0613	*F*=1.45, *P*=0.2146	*F*=1.91, *P*=0.1060	*F*=1.10, *P*=0.3573	*F*=2.26, *P*=0.0611	*F*=0.79, *P*=0.5336	*F*=1.34, *P*=0.2540	*F*=1.47, *P*=0.2080
Owner	*F*=2.82, *P*=0.0932	*F*=1.05, *P*=0.3063	*F*=0.28, *P*=0.6000	*F*=0.01, *P*=0.9092	*F*=0.54, *P*=0.4610	*F*=0.01, *P*=0.9170	*F*=0.11, *P*=0.7447	*F*=15.16, *P*=0.0001	*F*=0.11, *P*=0.7377
*Class*Owner*	*F*=2.88, *P*=0.0218	*F*=0.83, *P*=0.5081	*F*=0.45, *P*=0.7759	*F*=0.92, *P*=0.4535	*F*=0.63, *P*=0.6435	*F*=2.02, *P*=0.0893	*F*=1.82, *P*=0.1227	*F*=1.66, *P*=0.1568	*F*=0.91, *P*=0.4587
*Wtype*Owner*	*F*=3.13, *P*=0.0769	*F*=4.52, *P*=0.0336	*F*=2.41, *P*=0.1208	*F*=2.80, *P*=0.0946	*F*=6.27, *P*=0.0124	*F*=9.36, *P*=0.0023	*F*=0.01, *P*=0.9091	*F*=0.38, *P*=0.5396	*F*=0.02, *P*=0.8795
*Class*Wtype*Owner*	*F*=1.60, *P*=0.1713	*F*=0.69, *P*=0.5984	*F*=0.45, *P*=0.7753	*F*=1.05, *P*=0.3801	*F*=1.53, *P*=0.1900	*F*=1.30, *P*=0.2677	---	---	---
Lsize	*F*=369.47, *P*<0.0001	*F*=483.03, *P*<0.0001	*F*=272.94, *P*<0.0001	*F*=450.87, *P*<0.0001	*F*=318.53, *P*<0.0001	*F*=161.98, *P*<0.0001	*F*=300.02, *P*<0.0001	*F*=117.40, *P*<0.0001	*F*=54.56, *P*<0.0001
Juldate	*F*=5.27, *P*=0.0218	*F*=42.16, *P*<0.0001	*F*=0.01, *P*=0.9293	*F*=60.94, *P*<0.0001	*F*=2.10, *P*=0.1472	*F*=0.32, *P*=0.5702	*F*=11.54, *P*=0.0007	*F*=46.45, *P*<0.0001	*F*=0.27, *P*=0.6014

Variable (table 1)	RWBL	BWTE	MALL	AMCO	GADW	COYE	YHBL	NSHO	SAVS
East	F=2.39, P=0.1225	F=57.39, P<0.0001	F=17.44, P<0.0001	F=29.02, P<0.0001	F=88.62, P<0.0001	F=6.50, P=0.0109	F=0.18, P=0.6692	F=56.48, P<0.0001	F=0.00, P=0.9818
North	F=43.54, P<0.0001	F=70.01, P<0.0001	F=21.60, P<0.0001	F=0.23, P=0.6327	F=54.91, P<0.0001	F=9.24, P=0.0024	F=1.48, P=0.2241	F=3.50, P=0.0614	F=31.77, P<0.0001

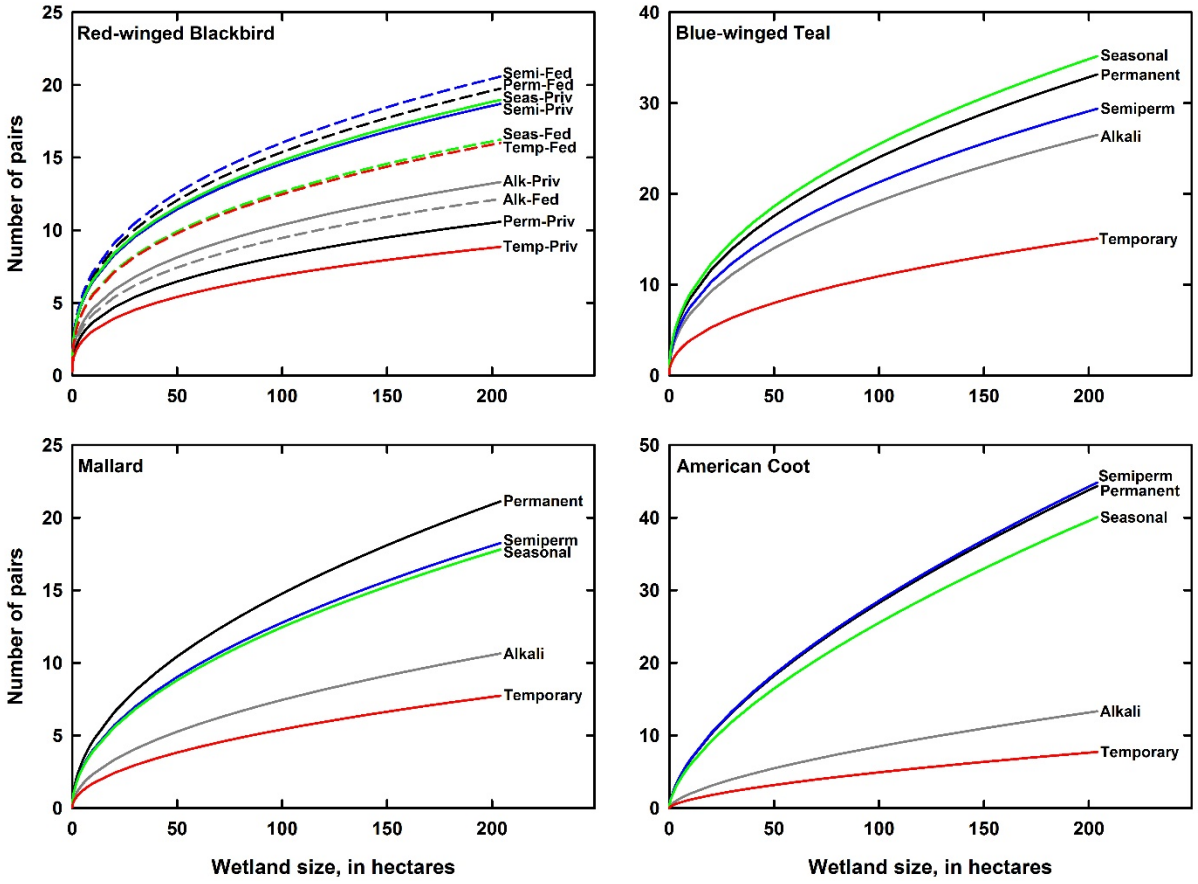

Figure 3. Plots of the number of breeding pairs compared to wetland size for each focal wetland bird species in the Prairie Pothole Region of North Dakota and South Dakota in 1995–97. Separate lines are graphed for each class, class-by-owner combination, or overall (if no class differences were detected in the analysis of covariance). For each line, Julian date, easting, and northing were held at their mean values, and intercepts were averaged across wetland types and owners (if not important). For overall lines for Gadwall and Savannah Sparrow, intercepts were averaged across all wetland classes, types, and owners. [Perm, Permanent; Semi or Semiperm, Semipermanent; Seas, Seasonal; Temp, Temporary; Alk, Alkali; Fed, Federal; Priv, Private]

Differences in the number of breeding pairs between natural and restored wetlands were detected for four of the nine species (tables 2 and 3; fig. 4). For three species (Gadwall, Common Yellowthroat, and Blue-winged Teal), the differences depended on wetland owner; however, for Blue-winged Teal, multiple comparisons between wetland types by ownership group indicated no differences between natural and restored wetlands for either private or Federal ownership. For Gadwall and Common Yellowthroat, the number of pairs observed on restored private wetlands was significantly greater than on natural private wetlands. For American Coot, number of pairs was significantly greater on natural wetlands than restored wetlands.

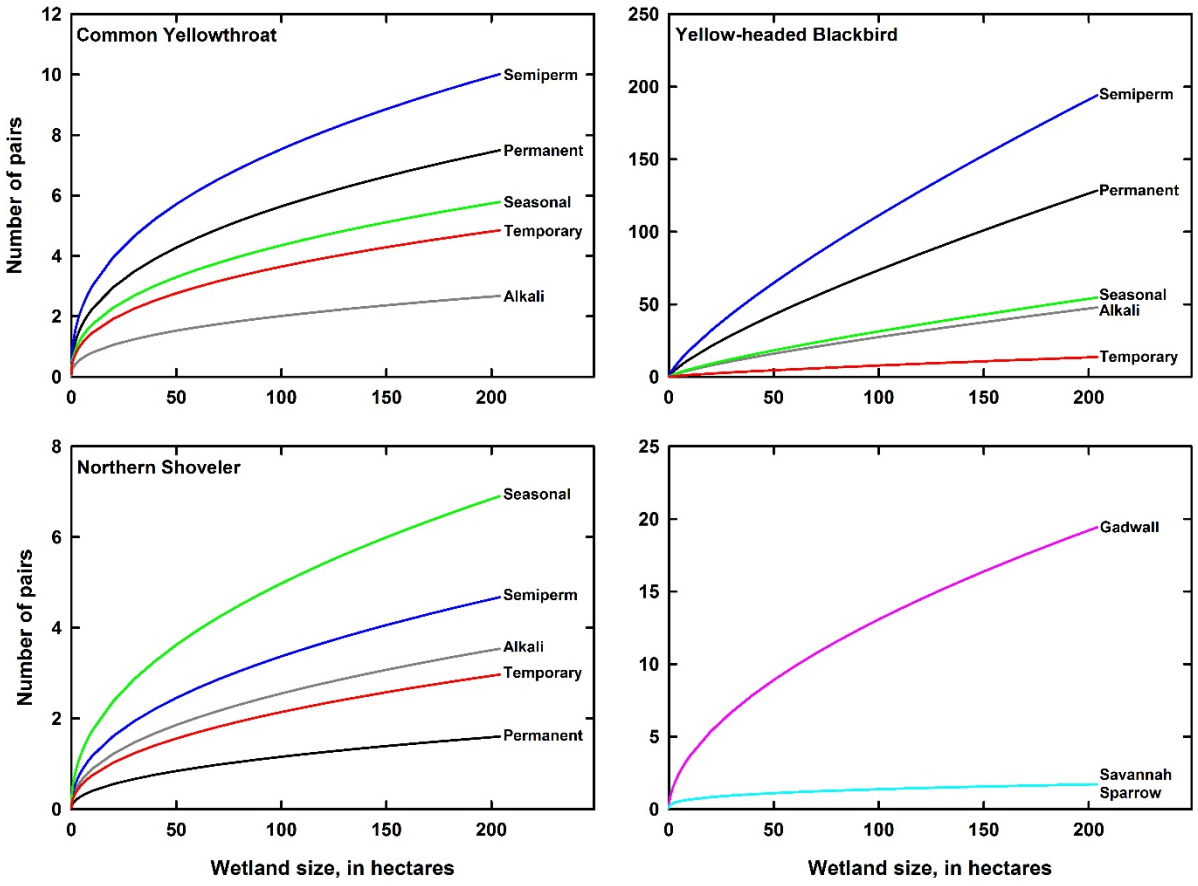

Figure 3. Plots of the number of breeding pairs compared to wetland size for each focal wetland bird species in the Prairie Pothole Region of North and South Dakota in 1995–97. Separate lines are graphed for each class, class-by-owner combination, or overall (if no class differences were detected in the analysis of covariance). For each line, Julian date, easting, and northing were held at their mean values, and intercepts were averaged across wetland types and owners (if not important). For overall lines for Gadwall and Savannah Sparrow, intercepts were averaged across all wetland classes, types, and owners. [Perm, Permanent; Semi or Semiperm, Semipermanent; Seas, Seasonal; Temp, Temporary; Alk, Alkali; Fed, Federal; Priv, Private]—Continued

For five of nine species, differences were detected between wetland owners (tables 2 and 3). The number of Northern Shoveler pairs was significantly greater for Federal wetlands than for private wetlands (fig. 4). For Red-winged Blackbird, differences in number of pairs between owners depended on the wetland class; numbers were significantly greater on Federal than on private land for temporary wetlands (fig. 3). For the remaining three species (Blue-winged Teal, Gadwall, and Common Yellowthroat), owner differences depended on wetland type (fig. 4). The number of pairs was significantly greater for Federal natural wetlands than for private natural wetlands for all three species. For Common Yellowthroat, private restored wetlands had significantly higher counts than Federal restored wetlands.

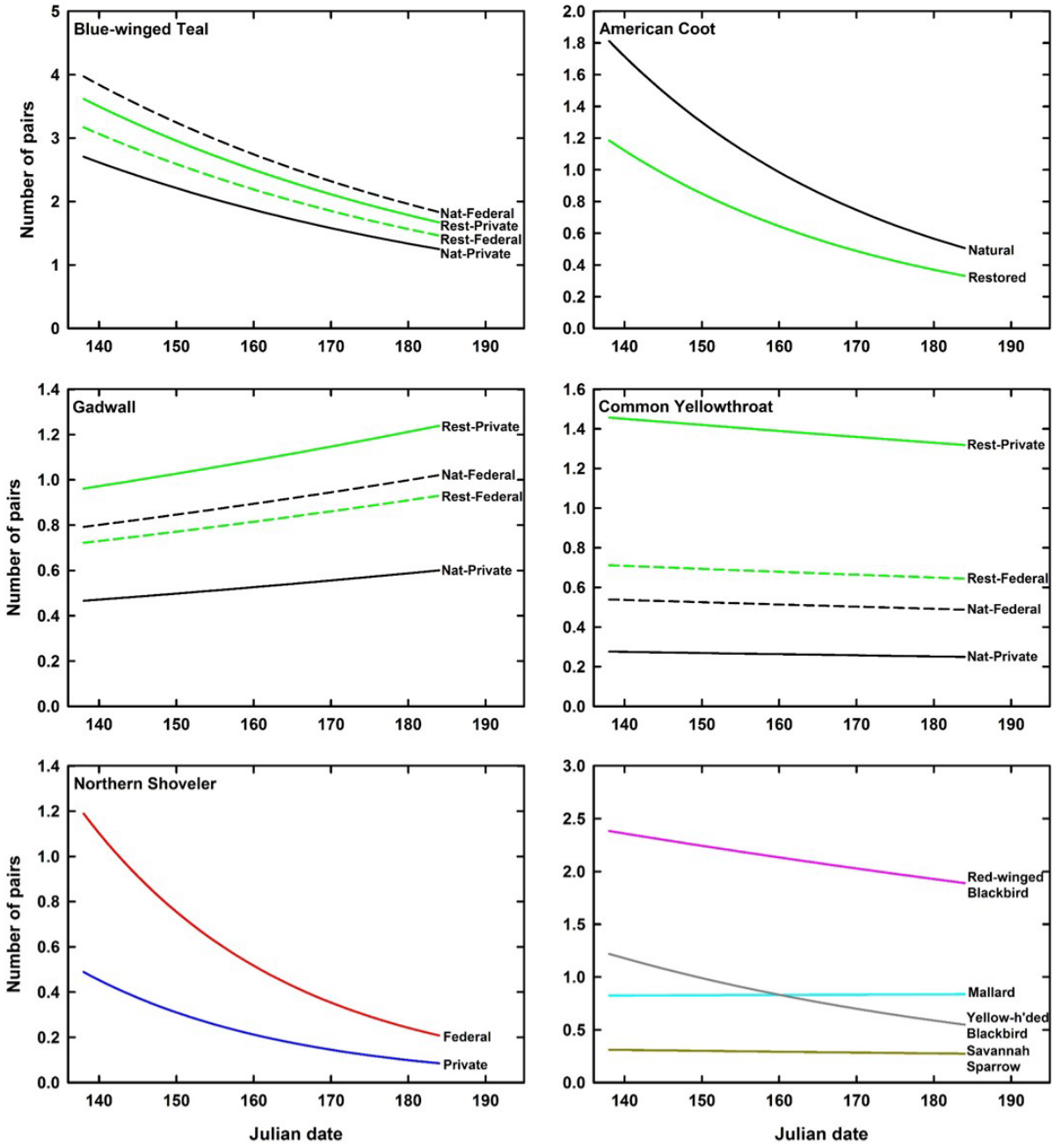

Figure 4. Plots of the number of pairs compared to Julian date for each wetland bird species in the Prairie Pothole Region of North and South Dakota in 1995–97. Separate lines are graphed for each wetland type, owner, type-by-owner, or overall (depending on results of the analysis of covariance). For each line, wetland size, easting, and northing were held at their mean values and intercepts were averaged across factors not included in plot. For overall lines for Mallard, Red-winged Blackbird, Yellow-headed Blackbird, and Savannah Sparrow, intercepts were averaged across all wetland classes, types, and owners. [Rest, Restored; Nat, Natural; h'ded, headed]

Influence of Wetland- and Landscape-Level Covariates

For each species, plausible models (ΔAIC_C<4.0) are given in table 4. For the Red-winged and Yellow-headed blackbirds, the percentage of the wetland in emergent vegetation (*EV*) was included in every plausible model; the number of indicated breeding pairs was positively related to *EV*. In addition, the best model included the percentage of wetland area within 800 m (*Wetland*800) for the Red-winged Blackbird and the percentage of grassland area within 800 m (*Grass*800) for the Yellow-headed Blackbird; both variables were negatively related to the number of breeding pairs. The percentage of the wetland in open water (*OW*) was included in every plausible model for the number of indicated breeding pairs of Blue-winged Teal, Mallard, American Coot, Gadwall, Common Yellowthroat, and Northern Shoveler—the relationships were positive for Blue-winged Teal, Mallard, American Coot, Gadwall, and Northern Shoveler, and negative for Common Yellowthroat. For Gadwall and Common Yellowthroat, the best models also included the number of wetlands within 800 m (*Numwet*800); these relationships were negative. For Blue-winged Teal, the best model included only *OW*, and for Mallard the best model included a positive relationship with *Wetland*800 and a negative relationship with *Numwet*800. The *Grass*800 was included in the best model for American Coot; the number of breeding pairs of coots was negatively related to *Grass*800. The best model for Northern Shoveler also included a positive relationship with *Wetland*800. For Savannah Sparrow, Grass800 was included in every plausible model; the number of pairs was positively related to *Grass*800. In addition, the best model included a positive relationship with *OW*. Pseudo-R^2 for all the best models ranged from 0.09 to 0.18, indicating that the fit of these models was somewhat poor. Plots of predicted versus observed values also revealed that the fits of the models were poor and the models had low predictive power.

Discussion

Wetlands in the study area provided habitat for many species of birds during the breeding season in the Prairie Pothole Region of North and South Dakota (fig. 1). Over one-half of the 133 species are considered obligate wetland birds (depend on wetlands for their entire life cycle; for example, Pied-billed Grebe) or facultative wetland birds (use wetlands as part of a wider array of habitats; for example, Common Yellowthroat) (Grover and Baldassarre, 1995; Weller, 1999; Locky and others, 2005). Several of these wetland species (for example, Least and American bitterns, Western and Horned grebes [*Aechmophorus occidentalis* and *Podiceps auritus*, respectively], Franklin's Gull, and Black Tern) are designated as species of conservation concern in this region (Beyersbergen and others, 2004; USFWS, 2008; South Dakota Department of Game, Fish and Parks, 2014; Dyke and others, 2015). Species of conservation concern were found in all classes of wetlands, on private and Federal wetlands, and on natural and restored wetlands.

Several grassland bird species (for example, Bobolink [*Dolichonyx oryzivorus*] and Savannah Sparrow) also used wetland habitats in this study. Admittedly, there is considerable overlap between lists of facultative wetland birds (Grover and Baldassarre, 1995; Locky and others, 2005) and lists of facultative grassland birds (Vickery and others, 1999), which, in part, reflects the similarity in grass-like vegetation that is characteristic of both wetlands and grasslands (for example, Le Conte's Sparrow [*Ammodramus leconteii*] use of both wet meadow and upland grassland habitats in this region; Igl, 1999; Igl and Johnson, 1999). Wetlands, or their margins, also may be an important habitat for some grassland-breeding birds (for example,

Table 4. Information-theoretic results for assessing effects of wetland and landscape variables on the number of breeding pairs of nine focal species (*n*=1,190 wetlands) in the Prairie Pothole Region of North and South Dakota in 1995–97.

[Signs of the parameter estimates were included in parentheses for the continuous covariates. Best models ($\Delta AIC_C < 4.0$) are listed on top for each species. *k*, number of parameters. LL, log likelihood; AIC_C, Akaike's Information Criteria for small sample sizes; ΔAIC_C, difference in AIC_C from model with the lowest AIC_C; *w*, Akaike weight (relative likelihood of each model); Pseudo-R^2, indication of model fit; *Class*, wetland class (alkali, permanent, semipermanent, seasonal, or temporary); *Owner*, landowner group (private or Federal); *Lsize*, log-transformed (natural logarithm) wetland size; (+), positive relationship; *Juldate*, Julian date of survey; (–), negative relationship; *North*, rescaled northing; *EV*, percentage of the wetland in emergent vegetation; *Wetland*800, percentage of wetland area within 800 meters; *Numwet*800, number of wetlands within 800 meters; *Grass*800, percentage of grassland area within 800 meters; *Wtype*, wetland type (natural or restored); *East*, rescaled easting; *OW*, percentage of the wetland in open water; *WM*, percentage of the wetland in wet meadow]

Species	Plausible models	*k*	LL	AIC_C	ΔAIC_C	*w*	Pseudo-R^2
Red-winged Blackbird	*Class*Owner*, *Lsize*(+), *Juldate*(–), *North*(–), *EV*(+), *Wetland*800(–)	16	–2,407.58	4,847.63	0.000	0.396	0.13
	*Class*Owner*, *Lsize*(+), *Juldate*(–), *North*(–), *EV*(+)	15	–2,409.13	4,848.68	1.049	0.234	0.13
	*Class*Owner*, *Lsize*(+), *Juldate*(–), *North*(–), *EV*(+), *Wetland*800(–), *Numwet*800(–)	17	–2,407.49	4,849.51	1.881	0.154	0.13
	*Class*Owner*, *Lsize*(+), *Juldate*(–), *North*(–), *EV*(+), *Numwet*800(–)	16	–2,409.05	4,850.56	2.929	0.091	0.13
	*Class*Owner*, *Lsize*(+), *Juldate*(–), *North*(–), *EV*(+), *Grass*800(–)	16	–2,409.09	4,850.64	3.016	0.088	0.13
Blue-winged Teal	*Class*, *Wtype*Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *North*(–), *OW*(+)	15	–2,410.83	4,850.01	0.000	0.302	0.14
	Class, *Wtype*Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *North*(–), *OW*(+), *Wetland*800(+)	16	–2,409.83	4,850.07	0.064	0.292	0.14
	Class, *Wtype*Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *North*(–), *OW*(+), *Numwet*800(–)	16	–2,410.64	4,851.70	1.688	0.130	0.14
	Class, *Wtype*Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *North*(–), *OW*(+), *Wetland*800(+) *Numwet*800(–)	17	–2,409.70	4,851.87	1.865	0.119	0.14
	Class, *Wtype*Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *North*(–), *OW*(+), *Grass*800(–)	16	–2,410.81	4,852.02	2.011	0.110	0.14
	Class, *Wtype*Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *North*(–), *OW*(+), *Grass*800(–), *Numwet*800(–)	17	–2,410.64	4,853.74	3.736	0.047	0.14
Mallard	*Class*, *Lsize*(+), *East*(–), *North*(–), *OW*(+), *Wetland*800(+), *Numwet*800(–)	12	–1,718.25	3,460.76	0.000	0.545	0.13
	Class, *Lsize*(+), *East*(–), *North*(–), *OW*(+), *Numwet*800(–)	11	–1,719.93	3,462.08	1.312	0.283	0.13

Species	Plausible models	*k*	LL	AIC_C	ΔAIC_C	*w*	Pseudo-R^2
	Class, *Lsize*(+), *East*(–), *North*(–), *OW*(+), *Grass*800(+), *Numwet*800(–)	12	–1,719.91	3,464.09	3.329	0.103	0.13
American Coot	*Class*, *Wtype*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Grass*800(–)	13	–1,830.36	3,684.99	0.000	0.578	0.18
	Class, *Wtype*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Grass*800(–), *Numwet*800(+)	14	–1,830.34	3,687.00	2.012	0.211	0.18
	Class, *Wtype*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+)	12	–1,833.03	3,688.29	3.300	0.111	0.18
Gadwall	*Wtype*Owner*, *Lsize*(+), *East*(–), *North*(–), *OW*(+), Numwet800(–)	10	–1,593.52	3,207.22	0.000	0.488	0.18
	*Wtype*Owner*, *Lsize*(+), *East*(–), *North*(–), *OW*(+), *Grass*800(+), *Numwet*800(–)	11	–1,593.51	3,209.24	2.015	0.178	0.18
	*Wtype*Owner*, *Lsize*(+), *East*(–), *North*(–), *OW*(+), *Wetland*800(–), *Numwet*800(–)	11	–1,593.52	3,209.26	2.035	0.176	0.18
	*Wtype*Owner*, *Lsize*(+), *East*(–), *North*(–), *OW*(+)	9	–1,596.24	3,210.63	3.407	0.089	0.18
Common Yellowthroat	*Class*, *Wtype*Owner*, *Lsize*(+), *East*(+), *North*(–), *OW*(–), *Numwet*800(–)	15	–1,483.84	2,996.04	0.000	0.530	0.12
	Class, *Wtype*Owner*, *Lsize*(+), *East*(+), *North*(–), *OW*(–), *Grass*800(+), *Numwet*800(–)	16	–1,483.77	2,997.95	1.915	0.203	0.12
	Class, *Wtype*Owner*, *Lsize*(+), *East*(+), *North*(–), *OW*(–), *Wetland*800(–), *Numwet*800(–)	16	–1,483.81	2,998.02	1.985	0.196	0.12
Yellow-headed Blackbird	*Class*, *Lsize*(+), *Juldate*(–), *EV*(+), *Grass*800(–)	10	–1,874.71	3,769.60	0.000	0.583	0.15
	Class, *Lsize*(+), *Juldate*(–), *EV*(+), *Grass*800(–), *Numwet*800(–)	11	–1,874.03	3,770.29	0.687	0.413	0.15
Northern Shoveler	*Class*, *Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Wetland*800(+)	13	–1,063.35	2,150.97	0.000	0.268	0.14
	Class, *Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Grass*800(–)	13	–1,063.55	2,151.36	0.386	0.221	0.14
	Class, *Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Wetland*800(+), *Numwet*800(–)	14	–1,062.72	2,151.75	0.780	0.182	0.14
	Class, *Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Grass*800(–), *Numwet*800(–)	14	–1,063.07	2,152.45	1.485	0.128	0.14
	Class, *Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+)	12	–1,065.33	2,152.88	1.907	0.103	0.14
	Class, *Owner*, *Lsize*(+), *Juldate*(–), *East*(–), *OW*(+), *Numwet*800(–)	13	–1,064.44	2,153.14	2.168	0.091	0.14

Species	Plausible models	*k*	LL	AIC_C	ΔAIC_C	*w*	Pseudo-R^2
Savannah Sparrow	*Lsize*(+), *North*(+), *OW*(+), *Grass*800(+)	5	–950.771	1,913.61	0.000	0.310	0.09
	Lsize(+), *North*(+), *Grass*800(+)	4	–951.840	1,913.73	0.116	0.292	0.08
	Lsize(+), *North*(+), *OW*(+), *Grass*800(+), *Numwet*800(–)	6	–950.648	1,915.39	1.776	0.127	0.09
	Lsize(+), *North*(+), *Grass*800(+), *Numwet*800(–)	5	–951.752	1,915.57	1.961	0.116	0.08
	Lsize(+), *North*(+), *WM*(+), *Grass*800(+)	5	–951.832	1,915.73	2.120	0.107	0.08
	Lsize(+), *North*(+), *WM*(+), *Grass*800(+), *Numwet*800(–)	6	–951.747	1,917.59	3.976	0.042	0.08

Bobolink) in semiarid regions or during dry periods (Hubbard, 1982; Peterjohn and Sauer, 1999; Igl and others, 2008). In the northern Great Plains, Niemuth and others (in press) found that the occurrence of Bobolinks and Savannah Sparrows was positively associated with the area of emergent herbaceous wetlands within the surrounding landscape (that is, areas where herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with water), which is consistent with their selection for mesic grasslands.

Climatic variation is considered a primary driver of water conditions in the Prairie Pothole Region (van der Valk, 2005; Niemuth and others, 2010). Wetland area and water levels and regimes in the Prairie Pothole Region are dynamic over time, resulting in high interannual variation in aquatic vegetation (Kantrud and others, 1989b; Euliss and others, 2004) and persistence of water within wetlands (van der Valk, 2005; Niemuth and others, 2010; Harold A. Kantrud, oral commun.). Our study occurred during a period of deluge in the northern Great Plains (Williams-Sether and others, 1994; Williams-Sether, 1999; Winter and Rosenberry, 1998; Niemuth and others, 2010). High water during a deluge period typically is characterized by a turnover in plant populations, greater interspersion of emergent cover and open water, but lower overall productivity (Johnson and others, 2005); thus, inferences drawn from results from this study may be potentially limited to years with high precipitation and greater wetland availability.

Wetlands in this region follow a gradient of water permanency: temporary wetlands generally have the least amount of water and the most variability from 1 year to the next, whereas permanent wetlands have the greatest area and the least variability among years (Stewart and Kantrud, 1971; Niemuth and others, 2010). Wetland classification for an individual wetland in this region may vary among years because of fluctuations in water levels and water conditions; for example, a semipermanent wetland may be classified as a seasonal wetland during a dry period, and a temporary wetland may be classified as a seasonal wetland during a wet period (Niemuth and others, 2010; Harold A. Kantrud, oral commun.). In this study, focal wetlands were classified at the time of the bird surveys, and thus wetland classification of an individual wetland was not necessarily static across years.

Wetland classes differed in their potential to provide habitat for different wetland bird species. We observed 76 species of birds in 165 temporary wetlands, 102 species in 410 seasonal wetlands, 109 species in 524 semipermanent wetlands, 96 species in 47 permanent wetlands, and 87 species in 44 alkali wetlands. For seven of the nine focal species in this study, abundances differed among wetland classes; for example, the Blue-winged Teal was less abundant on temporary wetlands than all other wetland classes and was significantly more abundant on seasonal than on semipermanent wetlands; Stewart and Kantrud (1973) and Kantrud and Stewart (1977) found similar results in North Dakota. In contrast, the American Coot was less abundant on alkali and temporary wetlands than on permanent, semipermanent, and seasonal wetlands, a result that also was shared by Kantrud and Stewart (1984). These contrasting results among species emphasize the ecological value of having a diversity of wetland classes in this region, including those that are generally smaller and shallower (that is, temporary and seasonal wetlands) and thus are most vulnerable to drainage (Niemuth and others, 2010).

We recorded 113 bird species on 610 private wetlands and 123 species on 580 Federal wetlands. Five of the nine focal species had higher abundances on Federal than on private wetlands. The Common Yellowthroat was the only species that had higher abundances on private wetlands than on Federal wetlands, but this was only observed for restored wetlands. For Red-winged Blackbird, differences in abundances between wetland owners depended on the wetland class; private temporary wetlands had fewer Red-winged Blackbird pairs than Federal temporary

wetlands. These species-specific results defy a simple ecological explanation, and further research is needed to address questions related to differences in wetland bird abundance between public and private lands. Although land management on private and public lands differ and are mostly independent of each other, the matrix of private land surrounding public land can affect wildlife populations occupying public lands and vice versa (Petit and others, 1995). Nonetheless, these results highlight the importance of protected public lands for wetland birds, and also emphasize that the conservation of wetland birds in the Prairie Pothole Region will depend on conservation efforts on both private and public lands. The extent of private lands in this region (Cowardin and others, 1995; Cunningham, 2005) and the United States (Ciuzio and others, 2013) far surpasses that of public lands. Over 90 percent of land in the Prairie Pothole Region is in private ownership (Cowardin and others, 1995). The loss of wetlands on private lands continues. Between 1997 and 2009, the total wetland area in the Prairie Pothole Region declined by over 30,000 ha or 1.1 percent, and the total number of wetlands declined by 4 percent (Dahl, 2014). In total, 96 percent of the wetlands lost were temporarily flooded emergent and farmed wetlands (mean size of 0.3 ha). Between 2008 and 2012, 12,555 ha of wetlands were lost in North and South Dakota because of conversion to agriculture (Lark and others, 2015). Bird conservation in the United States will increasingly rely on State and Federal agencies to allocate resources for bird conservation programs on private lands (Ciuzio and others, 2013).

Our study occurred during a period of numerous wetland restorations in the Prairie Pothole Region. Since the mid-1980s, wetland restoration has become an important tool for natural resource managers for mitigating losses of natural wetlands that had been drained on private or public lands in the Prairie Pothole Region (Galatowitsch and van der Valk, 1994, 1996; Fairbairn and Dinsmore, 2001; Ratti and others, 2001). These restoration efforts, in part, were spurred by the implementation of the North American Waterfowl Management Plan and the initiation of the Conservation Reserve Program in the 1985 Food Security Act (Galatowitsch and van der Valk, 1994). We recorded 105 species in 426 restored wetlands and 124 species in 764 natural wetlands. American Coot had higher abundances on natural wetlands than on restored wetlands, and Gadwall and Common Yellowthroat had higher abundances on restored private wetlands than on natural private wetlands. Ratti and others (2001) also reported higher abundances on restored wetlands than natural wetlands in North and South Dakota for 4 of 14 wetland-dependent bird species; they also reported higher abundances of American Coots, Common Yellowthroats, and Gadwalls on restored wetlands than natural wetlands, but their results were nonsignificant. Ratti and others (2001) speculated that these differences in abundance may reflect an attraction to higher aquatic productivity in these regenerating restored wetlands.

Many studies have compared breeding bird species richness, abundance, diversity, and community composition in restored and natural wetlands in the Prairie Pothole Region (LaGrange and Dinsmore, 1989; Sewell and Higgins, 1991; Delphey and Dinsmore, 1993; Hemesath and Dinsmore, 1993; Schreiber, 1994; Schafer, 1996; VanRees-Siewert and Dinsmore, 1996; Dault, 2001; Ratti and others, 2001) and elsewhere in the United States (Hartman, 1994; Brown and Smith, 1998; Muir Hotaling and others, 2002). As with our study, previous research has indicated that restored wetlands are providing valuable habitat for many species of birds during the breeding season, which emphasizes the value of efforts to restore wetlands in this region (Ratti and others, 2001); however, Galatowitsch and van der Valk (1994, 1996) cautioned that, although plant or bird communities of restored wetlands may resemble those of natural wetlands as successional changes occur with age (for example, VanRees-Siewert and Dinsmore,

1996; Fairbairn and Dinsmore, 2001), restored wetlands with only some of the characteristics of natural wetlands should not be considered comparable to natural wetlands in function. Moreover, we did not assess the age of the wetland restorations, which has been shown to affect the level of bird use in restored wetlands (VanRees-Siewert and Dinsmore, 1996; Muri Hotaling and others, 2002).

In the ANCOVA, we found a consistent positive relationship between the number of breeding pairs and wetland size for all nine focal species, indicating that the abundance of these species increased with the size of the wetland. Other studies have found that bird abundance increases with wetland size during the breeding season (Cowardin and others, 1995; Benoit and Askins, 2002; González-Gajardo and others, 2009; Sebastián-González and Green, 2014) and nonbreeding season (Webb and others, 2010). Several mechanisms have been proposed to explain why abundance is higher in larger wetlands, including greater habitat diversity, invertebrate food availability, and area for home range or territory-size requirements (Tozer and others, 2010). This relationship, however, does not negate the ecological value of numerous small wetlands located collectively in the landscape of the Prairie Pothole Region. Indeed, most of the wetlands in our study were small (that is, 2 ha or smaller). Small wetlands are critical for maintaining regional diversity, ecological connection, and source-sink dynamics of species populations (Semlitsch and Bodie, 1998). Several studies have emphasized the importance of small, temporary wetlands for migrating and breeding wetland birds (for example, Gibbs, 1993; Naugle and others, 2000b); moreover, some species require both small and large wetlands at different points in their life history (for example, some waterfowl; Yerkes, 2000), and thus maintaining a variety of wetland sizes and classes on the landscape may be required to satisfy the needs of those species (Adamus, 2013).

After adjusting for wetland size, and the date and location of the surveys, our results demonstrate that incorporating both wetland- and landscape-level factors in models can improve our ability to predict abundances of wetland birds in the Prairie Pothole Region. The top model for eight of the nine focal species included both wetland- and landscape-level factors, whereas the best model for the Blue-winged Teal included only wetland-level factors; for example, in our study, the abundance of Red-winged and Yellow-headed blackbirds (both of which build nests in cattails and other emergent vegetation) had a positive relationship with the percentage of the wetland in emergent vegetation, a result that was supported by Fairbairn and Dinsmore (2001) and Naugle and others (2000b). However, the abundance of Red-winged Blackbird (a facultative wetland species that also nests in uplands) declined with the amount of wetlands in the landscape, whereas the abundance of the Yellow-headed Blackbird (an obligate wetland species that only nests in wetlands) declined in wetlands as the amount of grassland in the landscape increased. Many other studies have demonstrated the importance of both local- and landscape-level factors on bird communities (for example, Naugle and others, 2000a; Cunningham and Johnson, 2006; Tsai, 2007; Niemuth and others, 2008; Clough and others, 2009; Roselli and Stiles, 2012; Labbe and King, 2014; Galitsky and Lawler, 2015).

In this study, we recorded 133 species in a variety of wetland classes, types, and owners over a broad study area. Meeting the different habitat requirements of all wetland bird species and other wetland fauna in the Prairie Pothole Region will be challenging. As with other studies, our results reinforce the argument that wetland conservation and restoration will be most effective when considering the habitat characteristics at both the wetland scale and landscape scale (that is, considering habitat at multiple scales). Results from this study and others also emphasize the importance of wetland-grassland complexes (that is, clusters of wetlands of

various permanence levels embedded in a grassland landscape) to meet the habitat needs of individual species (for example, Black Tern; Naugle and others, 2000a) and ensure that suitable habitat is available for all wetland breeding birds (Gleason and others, 2011). Admittedly, the fit of our models was weak, indicating that the models have low predictive power and that our knowledge of wetland bird ecology in this region is incomplete. Other factors (for example, those that we did not measure or those associated with migration or on the wintering grounds) also are likely important in explaining wetland bird abundance in this region. Identifying and quantifying these other variables is critical for the conservation of wetland birds in this region.

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Appendix 1. Summary Statistics for Wetland Breeding Bird Study in the Prairie Pothole Region of North and South Dakota in 1995–97

Table 1–1. Total number of indicated breeding pairs observed in 1,190 wetland basins within the Prairie Pothole Region of North and South Dakota in 1995–97.

[Species are listed in order of abundance. Summaries are given across all 1,190 wetlands (includes zero counts for wetlands in which a species was not observed) and for only those wetlands in which the species was present. ---, no standard error because sample size equals one]

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Yellow-headed Blackbird[a]	*Xanthocephalus xanthocephalus*	4,454	3.743	0.324	470	9.477	0.747	1	162
Blue-winged Teal[a]	*Anas discors*	4,181	3.513	0.146	851	4.913	0.183	1	39
Red-winged Blackbird[a]	*Agelaius phoeniceus*	3,855	3.239	0.118	944	4.084	0.136	1	36
American Coot[a]	*Fulica americana*	2,861	2.404	0.158	595	4.808	0.283	1	96
Gadwall[a]	*Anas strepera*	1,932	1.624	0.115	565	3.419	0.219	1	71
Mallard[a]	*Anas platyrhynchos*	1,890	1.588	0.090	601	3.145	0.155	1	42
Marsh Wren	*Cistothorus palustris*	1,378	1.158	0.115	242	5.694	0.465	1	61
Common Yellowthroat[a]	*Geothlypis trichas*	1,306	1.097	0.058	523	2.497	0.104	1	19
Black Tern	*Chlidonias niger*	1,110	0.933	0.093	285	3.895	0.333	1	43

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Common Grackle	*Quiscalus quiscula*	1,050	0.882	0.089	258	4.070	0.346	1	58
Ruddy Duck	*Oxyura jamaicensis*	923	0.776	0.077	255	3.620	0.299	1	50
Northern Shoveler[a]	*Anas clypeata*	812	0.682	0.052	331	2.453	0.148	1	25
Eared Grebe	*Podiceps nigricollis*	769	0.646	0.220	55	13.982	4.428	1	173
Redhead	*Aythya americana*	647	0.544	0.047	231	2.801	0.177	1	21
Savannah Sparrow[a]	*Passerculus sandwichensis*	536	0.450	0.035	311	1.723	0.102	1	22
Sora	*Porzana carolina*	476	0.400	0.028	283	1.682	0.081	1	10
Pied-billed Grebe	*Podilymbus podiceps*	466	0.392	0.029	280	1.664	0.090	1	14
Eastern Kingbird	*Tyrannus tyrannus*	453	0.381	0.030	256	1.770	0.097	1	13
Killdeer	*Charadrius vociferus*	451	0.379	0.028	262	1.721	0.085	1	10
Lesser Scaup	*Aythya affinis*	447	0.376	0.044	135	3.311	0.276	1	22
Brown-headed Cowbird	*Molothrus ater*	425	0.357	0.034	211	2.014	0.144	1	19
Song Sparrow	*Melospiza melodia*	414	0.348	0.026	237	1.747	0.085	1	9
Northern Pintail	*Anas acuta*	386	0.324	0.031	210	1.838	0.133	1	19
Clay-colored Sparrow	*Spizella pallida*	318	0.267	0.024	177	1.797	0.106	1	8
Bobolink	*Dolichonyx oryzivorus*	316	0.266	0.020	216	1.463	0.063	1	5
Black-crowned Night-Heron	*Nycticorax nycticorax*	315	0.265	0.110	67	4.701	1.885	1	110

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Franklin's Gull	*Leucophaeus pipixcan*	308	0.259	0.100	44	7.000	2.525	1	93
Barn Swallow	*Hirundo rustica*	292	0.245	0.036	153	1.908	0.243	1	32
Green-winged Teal	*Anas carolinensis*	273	0.229	0.033	141	1.936	0.232	1	26
Virginia Rail	*Rallus limicola*	216	0.182	0.020	121	1.785	0.124	1	11
Sedge Wren	*Cistothorus platensis*	200	0.168	0.017	127	1.575	0.096	1	9
Wilson's Phalarope	*Phalaropus tricolor*	198	0.166	0.024	97	2.041	0.226	1	15
Ring-billed Gull	*Larus delawarensis*	174	0.146	0.037	56	3.107	0.676	1	28
American White Pelican	*Pelecanus erythrorhynchos*	172	0.145	0.037	34	5.059	0.971	1	23
Canvasback	*Aythya valisineria*	169	0.142	0.024	63	2.683	0.313	1	15
Canada Goose	*Branta canadensis*	133	0.112	0.025	59	2.254	0.414	1	21
Ring-necked Duck	*Aythya collaris*	133	0.112	0.017	63	2.111	0.185	1	7
Cliff Swallow	*Petrochelidon pyrrhonota*	130	0.109	0.020	62	2.097	0.275	1	10
American Wigeon	*Anas americana*	124	0.104	0.022	57	2.175	0.371	1	18
American Bittern	*Botaurus lentiginosus*	117	0.098	0.011	96	1.219	0.056	1	4
Yellow Warbler	*Setophaga petechia*	117	0.098	0.017	59	1.983	0.234	1	11
Willet	*Tringa semipalmata*	115	0.097	0.013	78	1.474	0.118	1	6
American Avocet	*Recurvirostra americana*	112	0.094	0.023	29	3.862	0.615	1	13

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Mourning Dove	*Zenaida macroura*	103	0.087	0.014	64	1.609	0.163	1	8
Western Meadowlark	*Sturnella neglecta*	101	0.085	0.011	75	1.347	0.075	1	4
American Goldfinch	*Spinus tristis*	96	0.081	0.012	63	1.524	0.143	1	9
Double-crested Cormorant	*Phalacrocorax auritus*	96	0.081	0.021	38	2.526	0.514	1	18
Tree Swallow	*Tachycineta bicolor*	91	0.076	0.014	64	1.422	0.201	1	13
Western Kingbird	*Tyrannus verticalis*	82	0.069	0.010	66	1.242	0.097	1	6
Marbled Godwit	*Limosa fedoa*	81	0.068	0.017	44	1.841	0.389	1	16
Le Conte’s Sparrow	*Ammodramus leconteii*	79	0.066	0.012	47	1.681	0.175	1	7
Horned Grebe	*Podiceps auritus*	74	0.062	0.022	28	2.643	0.791	1	22
Wood Duck	*Aix sponsa*	73	0.061	0.012	39	1.872	0.195	1	5
Willow Flycatcher	*Empidonax traillii*	72	0.061	0.012	39	1.846	0.216	1	6
Wilson’s Snipe	*Gallinago delicata*	72	0.061	0.008	60	1.200	0.066	1	4
Upland Sandpiper	*Bartramia longicauda*	66	0.055	0.008	55	1.200	0.071	1	4
Cattle Egret	*Bubulcus ibis*	61	0.051	0.041	7	8.714	6.567	1	48
Swamp Sparrow	*Melospiza georgiana*	52	0.044	0.009	30	1.733	0.209	1	6
Grasshopper Sparrow	*Ammodramus savannarum*	42	0.035	0.006	35	1.200	0.069	1	2
Horned Lark	*Eremophila alpestris*	36	0.030	0.007	26	1.385	0.167	1	4

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Cedar Waxwing	*Bombycilla cedrorum*	35	0.029	0.018	6	5.833	2.937	1	20
Chestnut-collared Longspur	*Calcarius ornatus*	34	0.029	0.008	18	1.889	0.322	1	5
Bank Swallow	*Riparia riparia*	33	0.028	0.010	15	2.200	0.571	1	8
Ring-necked Pheasant	*Phasianus colchicus*	26	0.022	0.005	22	1.182	0.142	1	4
American Robin	*Turdus migratorius*	23	0.019	0.004	21	1.095	0.066	1	2
Gray Catbird	*Dumetella carolinensis*	23	0.019	0.005	17	1.353	0.147	1	3
House Wren	*Troglodytes aedon*	23	0.019	0.005	20	1.150	0.109	1	3
Nelson's Sparrow	*Ammodramus nelsoni*	22	0.018	0.004	20	1.100	0.069	1	2
Least Flycatcher	*Empidonax minimus*	21	0.018	0.006	12	1.750	0.351	1	5
Northern Harrier	*Circus cyaneus*	21	0.018	0.004	20	1.050	0.050	1	2
Piping Plover	*Charadrius melodus*	20	0.017	0.006	10	2.000	0.447	1	5
Baird's Sparrow	*Ammodramus bairdii*	18	0.015	0.004	14	1.286	0.125	1	2
Baltimore Oriole	*Icterus galbula*	18	0.015	0.004	18	1.000	0.000	1	1
Western Grebe	*Aechmophorus occidentalis*	18	0.015	0.005	13	1.385	0.180	1	3
Northern Flicker	*Colaptes auratus*	17	0.014	0.003	17	1.000	0.000	1	1
Bufflehead	*Bucephala albeola*	16	0.013	0.004	11	1.455	0.207	1	3
Lesser Yellowlegs[b]	*Tringa flavipes*	16	0.013	0.005	9	1.778	0.222	1	3

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Orchard Oriole	*Icterus spurius*	16	0.013	0.003	16	1.000	0.000	1	1
Forster's Tern	*Sterna forsteri*	15	0.013	0.007	7	2.143	0.829	1	7
Red-tailed Hawk	*Buteo jamaicensis*	15	0.013	0.004	11	1.364	0.203	1	3
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	14	0.012	0.004	10	1.400	0.163	1	2
California Gull	*Larus californicus*	13	0.011	0.003	11	1.182	0.122	1	2
Great Blue Heron	*Ardea herodias*	13	0.011	0.003	12	1.083	0.083	1	2
Dickcissel	*Spiza americana*	12	0.010	0.003	11	1.091	0.091	1	2
Brown Thrasher	*Toxostoma rufum*	10	0.008	0.003	9	1.111	0.111	1	2
Great Horned Owl	*Bubo virginianus*	10	0.008	0.003	10	1.000	0.000	1	1
Vesper Sparrow	*Pooecetes gramineus*	9	0.008	0.003	6	1.500	0.342	1	3
Warbling Vireo	*Vireo gilvus*	9	0.008	0.003	9	1.000	0.000	1	1
White-rumped Sandpiper[b]	*Calidris fuscicollis*	9	0.008	0.005	2	4.500	0.500	4	5
Red-necked Grebe	*Podiceps grisegena*	8	0.007	0.003	6	1.333	0.211	1	2
Spotted Sandpiper	*Actitis macularius*	8	0.007	0.004	4	2.000	0.707	1	4
White-faced Ibis	*Plegadis chihi*	8	0.007	0.006	2	4.000	3.000	1	7
Least Sandpiper[b]	*Calidris minutilla*	7	0.006	0.003	5	1.400	0.400	1	3
Hooded Merganser	*Lophodytes cucullatus*	6	0.005	0.002	5	1.200	0.200	1	2

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Great Egret	*Ardea alba*	5	0.004	0.002	5	1.000	0.000	1	1
Short-eared Owl	*Asio flammeus*	5	0.004	0.002	5	1.000	0.000	1	1
Bullock's Oriole	*Icterus bullockii*	4	0.003	0.002	4	1.000	0.000	1	1
Common Nighthawk	*Chordeiles minor*	4	0.003	0.002	3	1.333	0.333	1	2
Greater Yellowlegs[b]	*Tringa melanoleuca*	4	0.003	0.002	3	1.333	0.333	1	2
Yellow-rumped Warbler[b]	*Setophaga coronata*	4	0.003	0.003	2	2.000	1.000	1	3
American Crow	*Corvus brachyrhynchos*	3	0.003	0.002	2	1.500	0.500	1	2
American Redstart[b]	*Setophaga ruticilla*	3	0.003	0.001	3	1.000	0.000	1	1
Gray Partridge	*Perdix perdix*	3	0.003	0.001	3	1.000	0.000	1	1
House Sparrow	*Passer domesticus*	3	0.003	0.001	3	1.000	0.000	1	1
Least Bittern	*Ixobrychus exilis*	3	0.003	0.001	3	1.000	0.000	1	1
Swainson's Hawk	*Buteo swainsoni*	3	0.003	0.001	3	1.000	0.000	1	1
Common Goldeneye	*Bucephala clangula*	2	0.002	0.002	1	2.000	---	2	2
Downy Woodpecker	*Picoides pubescens*	2	0.002	0.001	2	1.000	0.000	1	1
Red-eyed Vireo[b]	*Vireo olivaceus*	2	0.002	0.001	2	1.000	0.000	1	1
Rock Pigeon	*Columba livia*	2	0.002	0.002	1	2.000	---	2	2
Semipalmated Sandpiper[b]	*Calidris pusilla*	2	0.002	0.002	1	2.000	---	2	2

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Sprague's Pipit	*Anthus spragueii*	2	0.002	0.002	1	2.000	---	2	2
Tennessee Warbler[b]	*Leiothlypis peregrina*	2	0.002	0.002	1	2.000	---	2	2
Belted Kingfisher	*Megaceryle alcyon*	1	0.001	0.001	1	1.000	---	1	1
Blackpoll Warbler[b]	*Setophaga striata*	1	0.001	0.001	1	1.000	---	1	1
Brewer's Blackbird	*Euphagus cyanocephalus*	1	0.001	0.001	1	1.000	---	1	1
Canada Warbler[b]	*Cardellina canadensis*	1	0.001	0.001	1	1.000	---	1	1
Chipping Sparrow	*Spizella passerina*	1	0.001	0.001	1	1.000	---	1	1
Common Tern	*Sterna hirundo*	1	0.001	0.001	1	1.000	---	1	1
Eastern Bluebird	*Sialia sialis*	1	0.001	0.001	1	1.000	---	1	1
Eastern Wood Pewee	*Contopus virens*	1	0.001	0.001	1	1.000	---	1	1
Ferruginous Hawk	*Buteo regalis*	1	0.001	0.001	1	1.000	---	1	1
Great Crested Flycatcher	*Myiarchus crinitus*	1	0.001	0.001	1	1.000	---	1	1
Great-tailed Grackle	*Quiscalus mexicanus*	1	0.001	0.001	1	1.000	---	1	1
Lark Sparrow	*Chondestes grammacus*	1	0.001	0.001	1	1.000	---	1	1
Purple Martin	*Progne subis*	1	0.001	0.001	1	1.000	---	1	1
Sharp-tailed Grouse	*Tympanuchus phasianellus*	1	0.001	0.001	1	1.000	---	1	1
Snow Goose[b]	*Chen caerulescens*	1	0.001	0.001	1	1.000	---	1	1

Common name	Scientific name	Total number of pairs	Mean number of pairs for all 1,190 wetlands		Summary statistics for number of breeding pairs for only wetlands with species present				
			Mean	Standard error	Number of wetlands with species present	Mean	Standard error	Minimum	Maximum
Snowy Egret	*Egretta thula*	1	0.001	0.001	1	1.000	---	1	1
Veery	*Catharus fuscescens*	1	0.001	0.001	1	1.000	---	1	1
White Ibis[b]	*Eudocimus albus*	1	0.001	0.001	1	1.000	---	1	1
Wilson's Warbler[b]	*Cardellina pusilla*	1	0.001	0.001	1	1.000	---	1	1
Wood Thrush[b]	*Hylocichla mustelina*	1	0.001	0.001	1	1.000	---	1	1

[a]Species that were present in 25 percent or more of the 1,190 wetlands (that is, focal species).

[b]Species that typically do not breed in North Dakota or South Dakota wetlands, including migrants, vagrants, and oversummering shorebirds and waterfowl that breed in the tundra and boreal regions of northern North America.

Table 1–2. Proportion of wetlands in which each species was present surveyed in the Prairie Pothole Region of North and South Dakota in 1995–97.

[Species are listed in order of abundance. Proportions are given for the wetlands overall (1,190 wetlands surveyed); and by wetland class (alkali, permanent, semipermanent, seasonal, or temporary), wetland type (natural or restored), and landowner group (private or Federal). The numbers within parentheses in the column headings indicate the number of wetlands in each category. Alpha code, four-letter species code]

Common name	Alpha code	Proportion of wetlands surveyed with species present (1,190)	Proportion of wetlands surveyed by wetland class with species present					Proportion of wetlands surveyed by wetland type with species present		Proportion of wetlands surveyed by landowner group with species present	
			Alkali (44)	Permanent (47)	Semiper-manent (524)	Seasonal (410)	Temporary (165)	Natural (764)	Restored (426)	Private (610)	Federal (580)
Red-winged Blackbird	RWBL	0.793	0.727	0.872	0.872	0.795	0.533	0.788	0.803	0.744	0.845
Blue-winged Teal	BWTE	0.715	0.955	0.936	0.786	0.722	0.345	0.725	0.697	0.652	0.781
Mallard	MALL	0.505	0.727	0.936	0.582	0.451	0.212	0.510	0.495	0.428	0.586
American Coot	AMCO	0.500	0.591	0.894	0.595	0.454	0.176	0.542	0.425	0.425	0.579
Gadwall	GADW	0.475	0.955	0.851	0.500	0.446	0.230	0.478	0.469	0.413	0.540
Common Yellowthroat	COYE	0.439	0.250	0.681	0.574	0.349	0.218	0.394	0.521	0.387	0.495
Yellow-headed Blackbird	YHBL	0.395	0.341	0.787	0.594	0.234	0.067	0.428	0.336	0.300	0.495
Northern Shoveler	NSHO	0.278	0.705	0.532	0.252	0.295	0.133	0.296	0.246	0.241	0.317
Savannah Sparrow	SAVS	0.261	0.545	0.404	0.246	0.232	0.267	0.251	0.279	0.261	0.262
Black Tern	BLTE	0.239	0.318	0.596	0.313	0.185	0.018	0.287	0.155	0.177	0.305
Sora	SORA	0.238	0.295	0.404	0.294	0.188	0.121	0.238	0.237	0.225	0.252
Pied-billed Grebe	PBGR	0.235	0.318	0.638	0.313	0.166	0.024	0.276	0.162	0.164	0.310
Killdeer	KILL	0.220	0.568	0.574	0.206	0.212	0.091	0.232	0.200	0.225	0.216
Common Grackle	COGR	0.217	0.341	0.553	0.282	0.149	0.048	0.262	0.136	0.172	0.264

Common name	Alpha code	Proportion of wetlands surveyed with species present (1,190)	Proportion of wetlands surveyed by wetland class with species present					Proportion of wetlands surveyed by wetland type with species present		Proportion of wetlands surveyed by landowner group with species present	
			Alkali (44)	Permanent (47)	Semiper-manent (524)	Seasonal (410)	Temporary (165)	Natural (764)	Restored (426)	Private (610)	Federal (580)
Eastern Kingbird	EAKI	0.215	0.432	0.766	0.239	0.173	0.030	0.243	0.164	0.152	0.281
Ruddy Duck	RUDU	0.214	0.477	0.723	0.273	0.132	0.018	0.259	0.134	0.134	0.298
Marsh Wren	MAWR	0.203	0.114	0.383	0.351	0.080	0.012	0.213	0.185	0.148	0.262
Song Sparrow	SOSP	0.199	0.250	0.447	0.260	0.146	0.055	0.208	0.183	0.144	0.257
Redhead	REDH	0.194	0.364	0.638	0.261	0.107	0.024	0.221	0.146	0.128	0.264
Bobolink	BOBO	0.182	0.159	0.383	0.195	0.166	0.127	0.177	0.190	0.175	0.188
Brown-headed Cowbird	BHCO	0.177	0.591	0.511	0.181	0.137	0.061	0.194	0.148	0.149	0.207
Northern Pintail	NOPI	0.176	0.477	0.213	0.160	0.190	0.103	0.170	0.188	0.177	0.176
Clay-colored Sparrow	CCSP	0.149	0.318	0.489	0.132	0.105	0.170	0.147	0.153	0.121	0.178
Barn Swallow	BARS	0.129	0.295	0.213	0.153	0.107	0.036	0.127	0.131	0.130	0.128
Green-winged Teal	AGWT	0.118	0.409	0.298	0.111	0.107	0.042	0.140	0.080	0.082	0.157
Lesser Scaup	LESC	0.113	0.568	0.532	0.103	0.073	0.006	0.137	0.070	0.059	0.171
Sedge Wren	SEWR	0.107	0.114	0.234	0.107	0.093	0.103	0.097	0.124	0.097	0.117
Virginia Rail	VIRA	0.102	0.045	0.191	0.168	0.044	0.024	0.098	0.108	0.082	0.122
Wilson's Phalarope	WIPH	0.082	0.432	0.170	0.061	0.073	0.048	0.094	0.059	0.056	0.109
American Bittern	AMBI	0.081	0.136	0.340	0.097	0.056	0.000	0.093	0.059	0.046	0.117
Willet	WILL	0.066	0.432	0.298	0.046	0.044	0.018	0.081	0.038	0.051	0.081
Western Meadowlark	WEME	0.063	0.318	0.319	0.034	0.051	0.042	0.071	0.049	0.062	0.064

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			Alkali (44)	Permanent (47)	Semiper-manent (524)	Seasonal (410)	Temporary (165)	Natural (764)	Restored (426)	Private (610)	Federal (580)
Black-crowned Night-Heron	BCNH	0.056	0.159	0.298	0.073	0.020	0.000	0.072	0.028	0.016	0.098
Western Kingbird	WEKI	0.055	0.205	0.277	0.040	0.046	0.024	0.062	0.045	0.062	0.048
Mourning Dove	MODO	0.054	0.114	0.191	0.046	0.056	0.018	0.059	0.045	0.044	0.064
Tree Swallow	TRES	0.054	0.136	0.149	0.071	0.029	0.012	0.054	0.054	0.054	0.053
American Goldfinch	AMGO	0.053	0.114	0.085	0.067	0.041	0.012	0.054	0.052	0.041	0.066
Canvasback	CANV	0.053	0.227	0.362	0.046	0.027	0.006	0.065	0.031	0.028	0.079
Ring-necked Duck	RNDU	0.053	0.068	0.298	0.073	0.020	0.000	0.064	0.033	0.036	0.071
Cliff Swallow	CLSW	0.052	0.068	0.064	0.074	0.032	0.024	0.052	0.052	0.066	0.038
Wilson's Snipe	COSN	0.050	0.091	0.043	0.078	0.017	0.036	0.060	0.033	0.043	0.059
Canada Goose	CAGO	0.050	0.227	0.234	0.057	0.017	0.006	0.050	0.049	0.028	0.072
Yellow Warbler	YWAR	0.050	0.159	0.191	0.055	0.029	0.012	0.055	0.040	0.031	0.069
American Wigeon	AMWI	0.048	0.409	0.170	0.027	0.037	0.012	0.047	0.049	0.039	0.057
Ring-billed Gull	RBGU	0.047	0.386	0.277	0.027	0.029	0.000	0.062	0.021	0.038	0.057
Eared Grebe	EAGR	0.046	0.205	0.234	0.052	0.017	0.006	0.068	0.007	0.021	0.072
Upland Sandpiper	UPSA	0.046	0.114	0.106	0.055	0.032	0.018	0.050	0.040	0.039	0.053
Le Conte's Sparrow	LCSP	0.039	0.227	0.128	0.032	0.022	0.030	0.035	0.047	0.038	0.041
Franklin's Gull	FRGU	0.037	0.182	0.085	0.034	0.027	0.018	0.047	0.019	0.031	0.043
Marbled Godwit	MAGO	0.037	0.182	0.128	0.027	0.034	0.012	0.043	0.026	0.026	0.048

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Willow Flycatcher	WIFL	0.033	0.114	0.191	0.032	0.015	0.012	0.042	0.016	0.013	0.053
Wood Duck	WODU	0.033	0.045	0.043	0.052	0.020	0.000	0.034	0.031	0.018	0.048
Double-crested Cormorant	DCCO	0.032	0.114	0.106	0.042	0.015	0.000	0.038	0.021	0.018	0.047
Grasshopper Sparrow	GRSP	0.029	0.000	0.000	0.036	0.034	0.012	0.020	0.047	0.038	0.021
American White Pelican	AWPE	0.029	0.023	0.128	0.040	0.012	0.006	0.027	0.031	0.021	0.036
Swamp Sparrow	SWSP	0.025	0.000	0.021	0.044	0.012	0.006	0.026	0.023	0.023	0.028
American Avocet	AMAV	0.024	0.341	0.106	0.006	0.015	0.000	0.027	0.019	0.020	0.029
Horned Grebe	HOGR	0.024	0.250	0.128	0.011	0.010	0.006	0.030	0.012	0.016	0.031
Horned Lark	HOLA	0.022	0.136	0.043	0.017	0.015	0.018	0.026	0.014	0.028	0.016
Ring-necked Pheasant	RPHE	0.018	0.023	0.021	0.021	0.017	0.012	0.020	0.016	0.011	0.026
American Robin	AMRO	0.018	0.000	0.043	0.017	0.022	0.006	0.018	0.016	0.015	0.021
House Wren	HOWR	0.017	0.000	0.085	0.013	0.010	0.030	0.018	0.014	0.018	0.016
Nelson's Sparrow	NSTS	0.017	0.114	0.064	0.010	0.010	0.018	0.018	0.014	0.015	0.019
Northern Harrier	NOHA	0.017	0.068	0.064	0.015	0.005	0.024	0.020	0.012	0.013	0.021
Baltimore Oriole	BAOR	0.015	0.023	0.085	0.013	0.015	0.000	0.016	0.014	0.015	0.016
Chestnut-collared Longspur	CCLO	0.015	0.273	0.000	0.004	0.005	0.012	0.017	0.012	0.018	0.012
Gray Catbird	GRCA	0.014	0.045	0.128	0.013	0.005	0.000	0.018	0.007	0.008	0.021
Northern Flicker	NOFL	0.014	0.068	0.021	0.015	0.010	0.006	0.016	0.012	0.015	0.014

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Orchard Oriole	OROR	0.013	0.023	0.021	0.017	0.007	0.012	0.017	0.007	0.007	0.021
Bank Swallow	BANS	0.013	0.045	0.064	0.011	0.010	0.000	0.010	0.016	0.011	0.014
Baird's Sparrow	BAIS	0.012	0.068	0.021	0.002	0.015	0.018	0.013	0.009	0.013	0.010
Western Grebe	WEGR	0.011	0.091	0.085	0.008	0.002	0.000	0.017	0.000	0.005	0.017
Great Blue Heron	GTBH	0.010	0.045	0.021	0.015	0.002	0.000	0.012	0.007	0.003	0.017
Least Flycatcher	LEFL	0.010	0.000	0.043	0.010	0.010	0.006	0.010	0.009	0.011	0.009
Bufflehead	BUFF	0.009	0.091	0.106	0.004	0.000	0.000	0.013	0.002	0.000	0.019
California Gull	CAGU	0.009	0.091	0.064	0.004	0.005	0.000	0.012	0.005	0.007	0.012
Dickcissel	DICK	0.009	0.000	0.000	0.011	0.007	0.012	0.007	0.014	0.010	0.009
Red-tailed Hawk	RTHA	0.009	0.023	0.043	0.010	0.005	0.006	0.012	0.005	0.003	0.016
Great Horned Owl	GHOW	0.008	0.000	0.064	0.011	0.002	0.000	0.010	0.005	0.005	0.012
Northern Rough-winged Swallow	NRWS	0.008	0.000	0.000	0.013	0.005	0.006	0.007	0.012	0.010	0.007
Piping Plover	PIPL	0.008	0.182	0.021	0.000	0.002	0.000	0.009	0.007	0.003	0.014
Brown Thrasher	BRTH	0.008	0.023	0.021	0.008	0.007	0.000	0.012	0.000	0.008	0.007
Lesser Yellowlegs	LEYE	0.008	0.000	0.000	0.011	0.005	0.006	0.010	0.002	0.005	0.010
Warbling Vireo	WAVI	0.008	0.000	0.021	0.010	0.002	0.012	0.009	0.005	0.005	0.010
Cattle Egret	CAEG	0.006	0.000	0.000	0.010	0.005	0.000	0.007	0.005	0.005	0.007
Forster's Tern	FOTE	0.006	0.045	0.021	0.006	0.002	0.000	0.005	0.007	0.002	0.010

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			Alkali (44)	Permanent (47)	Semiper-manent (524)	Seasonal (410)	Temporary (165)	Natural (764)	Restored (426)	Private (610)	Federal (580)
Cedar Waxwing	CEDW	0.005	0.023	0.021	0.004	0.005	0.000	0.008	0.000	0.003	0.007
Red-necked Grebe	RNGR	0.005	0.023	0.064	0.004	0.000	0.000	0.007	0.002	0.002	0.009
Vesper Sparrow	VESP	0.005	0.000	0.021	0.002	0.005	0.012	0.008	0.000	0.003	0.007
Great Egret	GREG	0.004	0.000	0.021	0.004	0.002	0.006	0.003	0.007	0.003	0.005
Hooded Merganser	HOME	0.004	0.091	0.021	0.000	0.000	0.000	0.007	0.000	0.002	0.007
Least Sandpiper	LESA	0.004	0.068	0.021	0.002	0.000	0.000	0.005	0.002	0.002	0.007
Short-eared Owl	SEOW	0.004	0.023	0.000	0.000	0.005	0.012	0.004	0.005	0.003	0.005
Bullock's Oriole	BUOR	0.003	0.023	0.000	0.000	0.005	0.006	0.003	0.005	0.005	0.002
Spotted Sandpiper	SPSA	0.003	0.091	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.007
American Redstart	AMRE	0.003	0.000	0.000	0.002	0.002	0.006	0.003	0.002	0.003	0.002
Common Nighthawk	CONI	0.003	0.023	0.000	0.004	0.000	0.000	0.003	0.002	0.002	0.003
Gray Partridge	GRPA	0.003	0.000	0.000	0.002	0.002	0.006	0.001	0.005	0.003	0.002
Greater Yellowlegs	GRYE	0.003	0.000	0.021	0.002	0.002	0.000	0.003	0.002	0.003	0.002
House Sparrow	HOSP	0.003	0.000	0.043	0.002	0.000	0.000	0.004	0.000	0.002	0.003
Least Bittern	LEBI	0.003	0.000	0.000	0.006	0.000	0.000	0.003	0.002	0.002	0.003
Swainson's Hawk	SWHA	0.003	0.000	0.021	0.002	0.002	0.000	0.003	0.002	0.002	0.003
American Crow	AMCR	0.002	0.000	0.021	0.000	0.002	0.000	0.000	0.005	0.002	0.002
Downy Woodpecker	DOWO	0.002	0.000	0.021	0.000	0.002	0.000	0.003	0.000	0.002	0.002

Common name	Alpha code	Proportion of wetlands surveyed with species present (1,190)	Proportion of wetlands surveyed by wetland class with species present					Proportion of wetlands surveyed by wetland type with species present		Proportion of wetlands surveyed by landowner group with species present	
			Alkali (44)	Permanent (47)	Semiper-manent (524)	Seasonal (410)	Temporary (165)	Natural (764)	Restored (426)	Private (610)	Federal (580)
Red-eyed Vireo	REVI	0.002	0.000	0.000	0.000	0.005	0.000	0.001	0.002	0.003	0.000
White-faced Ibis	WFIB	0.002	0.000	0.000	0.004	0.000	0.000	0.003	0.000	0.000	0.003
White-rumped Sandpiper	WRSA	0.002	0.023	0.000	0.000	0.002	0.000	0.003	0.000	0.002	0.002
Yellow-rumped Warbler	YRWA	0.002	0.000	0.043	0.000	0.000	0.000	0.003	0.000	0.000	0.003
Belted Kingfisher	BEKI	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Blackpoll Warbler	BLPW	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.002	0.002	0.000
Brewer's Blackbird	BRBL	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.002	0.002	0.000
Canada Warbler	CAWA	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Chipping Sparrow	CHSP	0.001	0.000	0.021	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Common Goldeneye	COGO	0.001	0.000	0.021	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Common Tern	COTE	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Eastern Bluebird	EABL	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Eastern Wood Pewee	EAWP	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Ferruginous Hawk	FEHA	0.001	0.000	0.021	0.000	0.000	0.000	0.001	0.000	0.002	0.000
Great Crested Flycatcher	GCFL	0.001	0.000	0.000	0.000	0.000	0.006	0.001	0.000	0.002	0.000
Great-tailed Grackle	GTGR	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Lark Sparrow	LASP	0.001	0.023	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.000
Purple Martin	PUMA	0.001	0.000	0.000	0.000	0.000	0.006	0.001	0.000	0.000	0.002

Common name	Alpha code	Proportion of wetlands surveyed with species present (1,190)	Proportion of wetlands surveyed by wetland class with species present					Proportion of wetlands surveyed by wetland type with species present		Proportion of wetlands surveyed by landowner group with species present	
			Alkali (44)	Permanent (47)	Semiper-manent (524)	Seasonal (410)	Temporary (165)	Natural (764)	Restored (426)	Private (610)	Federal (580)
Rock Pigeon	RODO	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.002	0.002	0.000
Semipalmated Sandpiper	SESA	0.001	0.000	0.000	0.000	0.000	0.006	0.001	0.000	0.000	0.002
Sharp-tailed Grouse	STGR	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.002	0.002	0.000
Snow Goose	SNGO	0.001	0.000	0.021	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Snowy Egret	SNEG	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.002	0.000	0.002
Sprague’s Pipit	SPPI	0.001	0.023	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Tennessee Warbler	TEWA	0.001	0.023	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Veery	VEER	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.002	0.002	0.000
White Ibis	WHIB	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Wilson’s Warbler	WIWA	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002
Wood Thrush	WOTH	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.002	0.002	0.000

Table 1–3. Summary of wetland- and landscape-level variables overall and by wetland class (alkali, permanent, semipermanent, seasonal, or temporary), wetland type (natural or restored), and landowner group (private or Federal), including mean, standard error, and range, in the Prairie Pothole Region of North and South Dakota in 1995–97.

[The numbers within parentheses in the column headings indicate the number of wetlands in each category. In each cell, the first number is the mean value, the number within parentheses is the standard error, and the range is from the minimum to maximum values.]

Variable	Overall (1,190)	Wetland class					Landowner group		Wetland type	
		Alkali (44)	Permanent (47)	Semiperm-anent (524)	Seasonal (410)	Temporary (165)	Private (610)	Federal (580)	Natural (764)	Restored (426)
Wetland-level variables										
Wetland size (hectares)	4.02 (0.36) 0.01–204.26	26.56 (5.85) 0.39–204.26	23.60 (3.83) 0.30–130.00	3.58 (0.39) 0.03–72.00	1.36 (0.17) 0.01–32.00	0.47 (0.07) 0.01–6.36	5.30 (0.54) 0.01–204.26	1.72 (0.25) 0.01–64.0	2.00 (0.30) 0.01–72.00	6.15 (0.67) 0.01–204.26
Percentage of the wetland in open water	37.38 (0.91) 0–100	64.61 (4.23) 0–100	62.55 (3.15) 0–95	42.71 (1.31) 0–98	33.17 (1.53) 0–95	16.48 (1.94) 0–95	41.95 (1.15) 0–100	29.19 (1.41) 0–95	28.45 (1.14) 0–100	46.78 (1.33) 0–100
Percentage of the wetland in emergent vegetation	24.84 (0.81) 0–100	12.16 (3.00) 0–85	20.30 (2.57) 0–95	32.35 (1.13) 0–100	20.31 (1.43) 0–100	16.96 (2.33) 0–100	22.86 (0.96) 0–100	28.41 (1.44) 0–100	25.49 (1.17) 0–100	24.17 (1.11) 0–100
Percentage of the wetland in wet meadow	33.63 (0.96) 0–100	14.86 (2.75) 0–90	12.30 (1.61) 0–40	23.08 (1.01) 0–100	43.14 (1.77) 0–100	54.57 (3.15) 0–100	30.68 (1.15) 0–100	38.91 (1.67) 0–100	40.66 (1.39) 0–100	26.23 (1.23) 0–100
Percentage of the wetland in shoreline/ mudflat	3.61 (0.32) 0–100	8.36 (1.23) 0–30	4.85 (0.65) 0–15	1.88 (0.25) 0–90	3.26 (0.45) 0–95	8.38 (1.73) 0–100	3.93 (0.42) 0–100	3.04 (0.46) 0–100	4.86 (0.57) 0–100	2.30 (0.24) 0–50

Variable	Overall (1,190)	Wetland class					Landowner group		Wetland type	
		Alkali (44)	Permanent (47)	Semiperm-anent (524)	Seasonal (410)	Temporary (165)	Private (610)	Federal (580)	Natural (764)	Restored (426)
Landscape-level variables										
Percentage of grassland area within 800 meters	56.31 (0.65) 0–100	55.16 (3.41) 9–84	56.00 (3.08) 14–92	55.48 (0.99) 0–97	57.68 (1.09) 0–92	55.97 (1.88) 0–97	55.37 (0.85) 0–97	58.00 (1.02) 5–96	55.05 (0.94) 0–97	57.64 (0.90) 5–92
Percentage of agricultural area within 800 meters	23.56 (0.64) 0–90	16.93 (3.42) 0–85	20.68 (2.84) 0–63	23.50 (0.96) 0–84	23.50 (1.06) 0–90	26.52 (1.87) 0–88	23.27 (0.82) 0–90	24.08 (1.00) 0–84	28.16 (0.95) 0–90	18.72 (0.81) 0–84
Percentage of wetland area within 800 meters	14.44 (0.29) 0–82	22.16 (2.20) 0–68	18.81 (2.04) 3–82	15.23 (0.42) 0–77	13.20 (0.40) 0–63	11.72 (0.79) 0–81	16.02 (0.38) 0–82	11.61 (0.39) 0–63	11.02 (0.31) 0–54	18.03 (0.44) 0–82
Number of wetlands within 800 meters	27.52 (0.39) 1–75	14.59 1.64) 1–54	18.81 (1.46) 1–57	28.49 (0.59) 3–75	27.71 (0.58) 1–66	29.89 (1.13) 3–74	27.97 (0.48) 1–75	26.71 (0.64) 2–68	29.28 (0.56) 1–75	25.67 (0.51) 1–68

Table 1–4. Summary of wetland- and landscape-level variables for each species, including mean, standard error, and range, in the Prairie Pothole Region of North and South Dakota in 1995–97.

[Only wetlands in which the species was observed were used to compute these summaries. In each cell, the first number is the mean value, the number within parentheses is the standard error, and the range is from the minimum to maximum value. m, meters; (–), no standard error because sample size equals one]

Common name	Number of wetlands with species present	Proportion of wetlands with species present	Wetland-level variables					Landscape-level variables			
			Wetland size (hectares)	Percentage of wetland in open water	Percentage of the wetland in emergent vegetation	Percentage of the wetland in wet meadow	Percentage of the wetland in shoreline/ mudflat	Percentage of grassland area within 800 m	Percentage of agricultural area within 800 m	Percentage of wetland area within 800 m	Number of wetlands within 800 m
Red-winged Blackbird	944	0.793	4.37 (0.38) 0.01–130	39.33 (1.01) 0–100	26.62 (0.91) 0–100	31.48 (1.02) 0–100	2.44 (0.24) 0–95	57.01 (0.73) 1–97	22.33 (0.7) 0–90	14.92 (0.33) 0–82	27.28 (0.42) 1–75
Blue-winged Teal	851	0.715	5.39 (0.5) 0.01–204.26	43.41 (1.04) 0–100	24.73 (0.9) 0–100	29.03 (1) 0–100	2.82 (0.26) 0–95	56.45 (0.76) 2–97	22.78 (0.72) 0–89	15.03 (0.34) 0–82	26.82 (0.46) 1–75
Mallard	601	0.505	6.9 (0.61) 0.01–130	46.84 (1.25) 0–100	24.24 (1.05) 0–100	26 (1.15) 0–100	2.9 (0.31) 0–95	57.09 (0.9) 3–97	21.71 (0.85) 0–84	15.53 (0.42) 0–82	25.13 (0.53) 1–75
American Coot	595	0.500	7 (0.69) 0.01–204.26	47.36 (1.18) 0–100	24.27 (0.97) 0–95	26.01 (1.1) 0–100	2.38 (0.24) 0–90	56.96 (0.91) 0–97	23.2 (0.87) 0–89	14.6 (0.37) 0–82	26.61 (0.52) 1–75
Gadwall	565	0.475	7.33 (0.72) 0.01–204.26	47.38 (1.28) 0–100	22.26 (1.01) 0–100	27.09 (1.21) 0–100	3.12 (0.26) 0–40	58.46 (0.92) 3–97	21.32 (0.85) 0–87	14.66 (0.41) 0–82	24.38 (0.52) 1–75
Common Yellowthroat	523	0.439	5.27 (0.57) 0.01–130	37.86 (1.3) 0–100	30.89 (1.22) 0–100	29.05 (1.29) 0–100	2 (0.24) 0–50	56.93 (0.95) 5–97	22.14 (0.9) 0–84	15.18 (0.45) 0–82	25.74 (0.54) 1–66
Yellow-headed Blackbird	470	0.395	7.28 (0.68) 0.02–130	44.21 (1.32) 0–100	32.49 (1.16) 0–95	21.21 (1.05) 0–100	2.1 (0.27) 0–90	54.5 (1.02) 2–97	24.11 (0.99) 0–89	15.73 (0.43) 0–82	26 (0.58) 1–75
Northern Shoveler	331	0.278	7.64 (0.98) 0.02–204.26	46.79 (1.59) 0–100	21.68 (1.27) 0–100	28.17 (1.55) 0–100	3.34 (0.35) 0–35	56.91 (1.21) 2–97	22.65 (1.11) 0–89	15.27 (0.6) 0–82	25.24 (0.77) 1–75
Savannah Sparrow	311	0.261	8.06 (1.17) 0.01–204.26	42.96 (1.79) 0–99	21.34 (1.39) 0–100	32.25 (1.85) 0–100	3.16 (0.34) 0–50	60.93 (1.17) 3–96	20.11 (1.14) 0–85	13.95 (0.58) 0–82	27.14 (0.78) 1–75

Common name	Number of wetlands with species present	Proportion of wetlands with species present	Wetland-level variables					Landscape-level variables			
			Wetland size (hectares)	Percentage of wetland in open water	Percentage of the wetland in emergent vegetation	Percentage of the wetland in wet meadow	Percentage of the wetland in shoreline/ mudflat	Percentage of grassland area within 800 m	Percentage of agricultural area within 800 m	Percentage of wetland area within 800 m	Number of wetlands within 800 m
Black Tern	285	0.239	10.17 (1.09) 0.02–130	50.29 (1.66) 0–100	26.7 (1.39) 0–92	19.86 (1.29) 0–100	3.14 (0.44) 0–90	56.47 (1.35) 0–92	22.39 (1.31) 0–89	15.84 (0.56) 2–82	27.35 (0.81) 1–75
Sora	283	0.238	6.24 (0.79) 0.02–70	32.36 (1.57) 0–95	35.08 (1.69) 0–100	30.82 (1.73) 0–100	1.74 (0.25) 0–40	54.76 (1.36) 1–94	25.23 (1.35) 0–88	14.4 (0.65) 0–82	26.49 (0.81) 1–75
Pied-billed Grebe	280	0.235	11.61 (1.14) 0.05–130	50.99 (1.58) 0–100	25.16 (1.26) 0–92	22.1 (1.3) 0–100	1.75 (0.24) 0–30	57.49 (1.3) 6–97	21.14 (1.23) 0–87	16.13 (0.59) 0–82	24.25 (0.77) 1–75
Killdeer	262	0.220	8.89 (1.23) 0.02–204.26	45.11 (1.9) 0–100	23.75 (1.55) 0–100	26.06 (1.73) 0–100	5.08 (0.52) 0–60	53.79 (1.42) 2–93	25.68 (1.42) 0–89	14.69 (0.62) 0–82	25.27 (0.82) 1–64
Common Grackle	258	0.217	9.21 (1.02) 0.04–100	53.65 (1.84) 0–100	23.33 (1.5) 0–100	20.13 (1.5) 0–100	2.9 (0.39) 0–50	54.79 (1.31) 1–92	23.21 (1.26) 0–85	15.88 (0.59) 0–63	25.88 (0.8) 1–64
Eastern Kingbird	256	0.215	11.48 (1.42) 0.08–204.26	48.71 (1.87) 0–100	24.65 (1.52) 0–95	23.55 (1.63) 0–100	3.09 (0.41) 0–50	58.04 (1.33) 7–97	20.48 (1.19) 0–81	15.86 (0.72) 0–82	23.14 (0.75) 1–61
Ruddy Duck	255	0.214	13.73 (1.45) 0.1–204.26	54.31 (1.68) 0–100	24.38 (1.31) 0–85	18.78 (1.27) 0–95	2.53 (0.43) 0–90	55.89 (1.42) 1–97	21.82 (1.29) 0–79	16.89 (0.68) 0–82	22.97 (0.73) 1–60
Marsh Wren	242	0.203	7.3 (0.97) 0.03–130	36.22 (1.73) 0–94	42.23 (1.66) 0–100	20.23 (1.35) 0–100	1.32 (0.22) 0–30	52.92 (1.46) 7–96	23.71 (1.4) 0–84	18 (0.82) 0–82	27.03 (0.91) 1–75
Song Sparrow	237	0.199	8.87 (1.22) 0.03–130	47.29 (2.04) 0–100	25.73 (1.68) 0–100	23.76 (1.7) 0–100	2.8 (0.43) 0–50	53.29 (1.39) 6–88	24.54 (1.38) 0–84	16.07 (0.65) 0–63	24.57 (0.77) 1–64
Redhead	231	0.194	12.34 (1.54) 0.05–204.26	52.55 (1.84) 0–100	27.19 (1.62) 0–92	17.21 (1.21) 0–98	3.05 (0.5) 0–90	53.77 (1.51) 7–97	23.67 (1.38) 0–79	17.13 (0.79) 0–82	25.15 (0.93) 1–75
Bobolink	216	0.182	6.78 (1.05) 0.01–100	40.79 (1.96) 0–95	25.97 (1.76) 0–100	30.78 (2.09) 0–100	2.46 (0.31) 0–30	59.42 (1.58) 0–97	20.69 (1.53) 0–84	14.49 (0.76) 0–82	26.66 (0.86) 1–64
Brown-headed Cowbird	211	0.177	10.53 (1.35) 0.03–130	46.55 (2.13) 0–100	25.93 (1.84) 0–97	24.09 (1.82) 0–100	3.43 (0.45) 0–35	55.75 (1.48) 9–92	22.66 (1.38) 0–85	16.3 (0.81) 1–77	24.08 (0.88) 1–75

Common name	Number of wetlands with species present	Proportion of wetlands with species present	Wetland-level variables					Landscape-level variables			
			Wetland size (hectares)	Percentage of wetland in open water	Percentage of the wetland in emergent vegetation	Percentage of the wetland in wet meadow	Percentage of the wetland in shoreline/ mudflat	Percentage of grassland area within 800 m	Percentage of agricultural area within 800 m	Percentage of wetland area within 800 m	Number of wetlands within 800 m
Northern Pintail	210	0.176	8 (1.33) 0.02–204.26	45.95 (2.05) 0–100	21 (1.62) 0–100	29.88 (2.08) 0–100	3.12 (0.42) 0–35	57.11 (1.57) 2–97	22.3 (1.41) 0–89	15.31 (0.81) 0–82	25.05 (0.93) 1–75
Clay-colored Sparrow	177	0.149	10.11 (1.85) 0.01–204.26	42.99 (2.27) 0–100	19.36 (1.79) 0–95	33.49 (2.5) 0–100	4.16 (0.69) 0–95	58.69 (1.53) 5–97	21.82 (1.48) 0–83	14.33 (0.88) 0–81	24.93 (1) 1–67
Barn Swallow	153	0.129	9.93 (1.94) 0.05–204.26	44.76 (2.6) 0–100	26.37 (2.27) 0–100	26.39 (2.39) 0–100	2.48 (0.48) 0–40	56.42 (1.68) 5–91	22.75 (1.67) 0–84	15.29 (0.93) 0–82	25.21 (1.07) 1–72
Green-winged Teal	141	0.118	10.46 (1.92) 0.05–204.26	50.48 (2.46) 0–100	20.96 (1.89) 0–90	24.32 (2.11) 0–100	4.17 (0.84) 0–95	58.65 (1.88) 5–93	20.18 (1.68) 0–84	16.37 (0.99) 0–82	22.69 (1.12) 1–75
Lesser Scaup	135	0.113	17.54 (2.33) 0.15–204.26	64.39 (2.06) 0–100	16.45 (1.42) 0–70	15.44 (1.53) 0–100	3.72 (0.49) 0–30	60.06 (1.85) 7–97	17.54 (1.67) 0–84	17.49 (0.98) 0–68	21.04 (1.13) 3–68
Sedge Wren	127	0.107	7.07 (1.4) 0.01–77.33	28.51 (2.43) 0–90	35.8 (2.77) 0–100	33.87 (2.87) 0–100	1.74 (0.29) 0–15	55.02 (1.91) 5–92	22.34 (1.7) 0–84	17.47 (1.4) 0–82	25.4 (1.23) 1–59
Virginia Rail	121	0.102	6.34 (1.07) 0.1–70	28.52 (2.1) 0–90	43.7 (2.4) 0–95	26.27 (2.21) 0–100	1.5 (0.33) 0–20	51.9 (2.02) 7–89	24.92 (1.92) 0–85	17.3 (0.98) 2–77	25.21 (1.07) 5–58
Wilson's Phalarope	97	0.082	12.92 (2.74) 0.02–204.26	45.12 (2.85) 0–95	25.02 (2.72) 0–100	24.49 (2.82) 0–100	5.36 (0.82) 0–35	56.43 (2.35) 9–90	19.7 (2.18) 0–75	18.86 (1.35) 2–82	25.29 (1.43) 1–68
American Bittern	96	0.081	13.47 (2.27) 0.1–130	39.15 (2.76) 0–95	32.6 (2.61) 0–100	25.61 (2.7) 0–95	2.74 (0.53) 0–30	55.79 (2.24) 13–97	21.5 (2.13) 0–75	16.99 (1.08) 1–63	21.69 (1.21) 1–57
Willet	78	0.066	14.71 (3.2) 0.2–204.26	51.97 (3.38) 0–100	19.73 (2.47) 0–100	21.78 (2.85) 0–100	6.51 (0.93) 0–35	57.78 (2.23) 7–86	20.51 (2.21) 0–81	16.71 (1.36) 2–68	22.26 (1.36) 3–68
Western Meadowlark	75	0.063	11.8 (2.49) 0.06–100	48.57 (3.23) 0–95	19.64 (2.71) 0–95	24.33 (3.09) 0–100	6.12 (0.74) 0–25	58.52 (2.35) 16–97	20.97 (2.51) 0–78	14.33 (1.24) 0–53	20.73 (1.36) 1–60
Black-crowned Night-Heron	67	0.056	15.25 (2.05) 0.1–70	65.33 (2.87) 10–100	20.6 (2.34) 0–80	12.58 (1.75) 0–75	1.49 (0.42) 0–20	57.54 (2.93) 8–88	18.99 (2.69) 0–83	18.4 (1.29) 4–63	21.1 (1.16) 5–45

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Western Kingbird	66	0.055	14.74 (2.86) 0.05–77.33	45.76 (4.11) 0–99	19.79 (2.62) 0–100	29.41 (3.76) 0–100	3.53 (0.75) 0–30	60.11 (2.23) 7–88	19.18 (2.1) 0–81	15.52 (1.26) 0–53	21.77 (1.58) 1–64
Mourning Dove	64	0.054	9.79 (2.58) 0.1–100	49.09 (3.3) 0–95	26.98 (2.94) 0–95	20.38 (3.01) 0–97	3.55 (0.88) 0–40	49.06 (2.49) 12–85	31.89 (2.71) 0–84	14.31 (1.17) 0–53	23.16 (1.42) 1–62
Tree Swallow	64	0.054	11.13 (2.3) 0.1–70	50.66 (3.76) 0–100	27.41 (3.17) 0–100	19.34 (2.85) 0–100	2.59 (0.73) 0–30	58.94 (2.41) 10–92	18.92 (2.44) 0–78	15.59 (1.12) 0–42	24.59 (1.56) 1–58
American Goldfinch	63	0.053	8.88 (2.04) 0.13–70	51.29 (3.88) 0–99	28.38 (3.41) 0–95	15.81 (2.52) 0–95	4.52 (0.94) 0–30	54.06 (2.76) 2–88	24.16 (2.59) 0–89	16.22 (1.11) 3–42	24.76 (1.53) 1–62
Canvasback	63	0.053	23.79 (4.29) 0.12–204.26	56.62 (3.61) 0–100	25.54 (3.12) 0–100	14.7 (1.76) 0–60	3.14 (0.65) 0–30	60.38 (2.84) 7–91	14.98 (2.38) 0–78	19.43 (1.98) 0–82	20.29 (1.71) 1–68
Ring-necked Duck	63	0.053	15.93 (3.15) 0.3–130	66.62 (2.99) 5–96	18.4 (2.46) 0–85	12.56 (1.37) 0–47	2.43 (0.55) 0–25	61.02 (2.65) 1–97	17.56 (2.53) 0–72	16.9 (1.49) 1–82	26.73 (1.94) 1–67
Cliff Swallow	62	0.052	10.74 (2.55) 0.1–100	45.92 (4.27) 0–96	26.45 (3.39) 0–90	24.1 (3.53) 0–100	3.53 (0.92) 0–40	58.55 (2.7) 1–85	17.97 (2.62) 0–84	18.13 (1.58) 2–63	29.71 (1.94) 6–58
Wilson’s Snipe	60	0.050	8.24 (2.2) 0.1–72	41.65 (3.81) 0–90	31.95 (3.4) 0–95	23.47 (2.84) 0–97	2.93 (0.97) 0–35	57.88 (2.95) 5–86	13.55 (2.45) 0–81	22.8 (2.2) 2–81	33.63 (2.22) 4–67
Canada Goose	59	0.050	18.61 (4.57) 0.21–204.26	62.97 (3.68) 2–96	19.07 (2.56) 0–83	15.46 (2.26) 0–90	2.51 (0.58) 0–20	59.36 (2.86) 8–92	15.61 (2.56) 0–65	20.51 (1.65) 2–68	25.76 (2.05) 1–67
Yellow Warbler	59	0.050	18.13 (3.85) 0.1–130	52.07 (3.86) 0–100	24.46 (2.94) 0–95	20.75 (3.27) 0–97	2.73 (0.68) 0–25	58.58 (2.62) 15–88	19.37 (2.77) 0–78	16.81 (1.34) 0–63	22.83 (1.73) 1–62
American Wigeon	57	0.048	18.49 (4.33) 0.05–204.26	61.96 (3.74) 0–100	11.04 (1.77) 0–60	22.67 (3.4) 0–100	4.33 (0.92) 0–30	61.51 (2.36) 10–88	15.26 (2.07) 0–65	17.95 (2) 3–82	19.98 (1.53) 1–54
Ring-billed Gull	56	0.047	23.96 (4.58) 0.25–204.26	62.96 (3.24) 2–100	16.43 (2.52) 0–83	14.16 (1.7) 0–60	6.45 (1.18) 0–35	55.86 (3.01) 9–86	20.71 (2.71) 0–65	17.91 (1.46) 4–68	18.07 (1.19) 1–51

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Eared Grebe	55	0.046	27.82 (4.57) 0.39–204.26	64.22 (3.4) 10–100	19.25 (2.55) 0–80	13.27 (2.05) 0–85	3.25 (0.73) 0–30	47.84 (3.12) 3–88	25.13 (2.94) 0–70	22.25 (2.06) 4–82	16.36 (1.21) 1–41
Upland Sandpiper	55	0.046	16.25 (4.47) 0.05–204.26	57.64 (3.85) 0–95	19.38 (2.77) 0–85	21.44 (3.44) 0–100	1.55 (0.4) 0–10	64.96 (2.53) 14–92	12.82 (2.12) 0–71	18.31 (1.8) 1–82	28.18 (2.09) 1–64
Le Conte's Sparrow	47	0.039	12.88 (2.76) 0.01–65	40.21 (4.28) 0–95	20.43 (3.31) 0–100	30.85 (4.35) 0–100	6.38 (1.31) 0–40	54.28 (3.25) 8–92	25.02 (3.23) 0–83	14.77 (2.2) 0–82	20.26 (1.88) 1–54
Franklin's Gull	44	0.037	15.58 (3.21) 0.06–72	54.23 (4.57) 0–100	22.8 (4.09) 0–95	19.52 (3.39) 0–94	3.45 (0.97) 0–30	46.98 (3.91) 1–87	26.66 (3.87) 0–81	20.3 (1.67) 5–53	22.91 (2.07) 5–60
Marbled Godwit	44	0.037	20.45 (5.44) 0.05–204.26	58.91 (4.23) 0–95	17.77 (3.55) 0–90	15.8 (3.27) 0–100	5.36 (1.23) 0–35	61.3 (3.27) 16–92	16 (2.73) 0–65	17.73 (2.03) 4–68	22.41 (1.81) 3–51
Willow Flycatcher	39	0.033	18.62 (4.97) 0.05–130	49.56 (4.36) 0–100	26.72 (3.9) 0–85	18.62 (3.54) 0–89	2.54 (0.81) 0–25	56.41 (2.89) 15–88	21.36 (2.95) 0–59	17.13 (1.31) 3–42	20.51 (1.63) 4–51
Wood Duck	39	0.033	10.56 (3.61) 0.11–130	44.85 (4.79) 5–90	29.92 (3.99) 0–85	21.74 (4.02) 0–89	3.49 (1.19) 0–30	55.49 (3.54) 6–85	21.56 (3.41) 0–84	16.72 (1.49) 0–42	19.51 (1.2) 4–37
Double-crested Cormorant	38	0.032	21.6 (4.27) 0.7–100	74.05 (3.2) 30–100	13.39 (2.19) 0–55	9.47 (1.97) 0–65	3.08 (0.96) 0–25	58.82 (3.92) 9–88	14.29 (3.28) 0–65	20.68 (2.61) 4–82	22.92 (2) 1–51
Grasshopper Sparrow	35	0.029	1.8 (0.38) 0.07–10	37.4 (4.7) 0–90	29.71 (5) 0–90	29.4 (5.18) 0–100	3.49 (1.35) 0–35	57.6 (3.46) 20–86	17.71 (2.94) 0–64	15.94 (2.08) 1–63	28.26 (2.51) 4–58
American White Pelican	34	0.029	14.57 (3.59) 0.2–77.33	60.56 (4.68) 10–100	25.29 (4.05) 0–80	10.65 (2) 0–50	3.5 (1.14) 0–35	60.24 (3.74) 10–87	13.56 (3.31) 0–65	20.09 (1.83) 7–50	22.82 (2.55) 5–64
Swamp Sparrow	30	0.025	5.55 (2.46) 0.13–70	26.8 (4.34) 0–80	37.77 (5.31) 0–95	33.97 (5.05) 0–97	1.47 (1.04) 0–30	58.4 (4.39) 9–88	9.77 (2.33) 0–42	25.97 (3.42) 1–77	23.97 (2.28) 4–55
American Avocet	29	0.024	25.35 (8.33) 0.2–204.26	53.69 (5.06) 0–95	13.21 (2.45) 0–40	21.83 (3.99) 0–90	11.28 (1.6) 0–35	55.48 (4.23) 5–82	17.59 (3.65) 0–67	20.76 (2.56) 4–68	19.07 (2.29) 3–53

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Horned Grebe	28	0.024	21.86 (4.63) 0.2–77.33	61.32 (3.55) 20–95	17.25 (3.29) 0–65	16.11 (2.11) 0–35	5.32 (1.01) 0–20	60.14 (3.45) 23–88	18.29 (3.24) 0–62	17.04 (2.15) 3–50	17.54 (1.77) 1–40
Horned Lark	26	0.022	21.11 (8.75) 0.06–204.26	43.46 (6) 0–90	21.92 (5.26) 0–85	17.38 (3.67) 0–85	13.58 (5.1) 0–100	37.81 (4.16) 1–80	41.62 (5.2) 0–88	15.65 (2.67) 2–68	20.42 (2.44) 1–47
Ring-necked Pheasant	22	0.018	3.41 (1.23) 0.08–25	29.91 (6.32) 0–95	28.18 (6.72) 0–100	40.09 (7.65) 0–90	1.82 (0.84) 0–15	50.32 (3.82) 6–79	28.77 (3.85) 4–84	15.27 (1.68) 0–31	23.27 (1.6) 6–34
American Robin	21	0.018	3.69 (1.11) 0.05–17.41	52.76 (7.86) 0–96	23.29 (6.36) 0–95	14.71 (4.45) 0–75	4.48 (2.03) 0–40	53.05 (4.17) 25–85	27.19 (4.74) 0–69	13.76 (1.4) 1–28	25.67 (2.17) 8–51
House Wren	20	0.017	4.79 (2.2) 0.05–32	35.4 (6.92) 0–93	22.15 (5.18) 0–80	34.35 (7.53) 0–100	3.1 (1.42) 0–20	57.3 (4.67) 17–97	23.2 (3.86) 0–54	13.6 (1.83) 0–30	28.4 (2.78) 9–62
Nelson’s Sparrow	20	0.017	11.35 (3.33) 0.2–42	42.25 (6.24) 0–85	15 (3.79) 0–50	34 (6.52) 0–100	8.75 (5.06) 0–100	49.4 (5.69) 9–88	30.4 (5.19) 0–78	15.8 (2.19) 0–32	21.7 (2.69) 3–42
Northern Harrier	20	0.017	23.56 (10.38) 0.01–204.26	47.25 (6.94) 0–90	27.8 (6.21) 0–95	22.4 (7.46) 0–100	2.55 (0.93) 0–10	54.55 (4.83) 17–88	20.25 (5.39) 0–76	19.45 (3.9) 2–68	21.4 (2.72) 3–47
Baltimore Oriole	18	0.015	15.92 (5.09) 0.2–64	54.61 (7.71) 0–90	17.44 (3.45) 5–40	26.44 (5.59) 3–80	1.5 (0.78) 0–10	60.06 (4.03) 25–85	17.22 (3.17) 0–40	17.39 (3.86) 3–63	20.33 (2.23) 1–40
Chestnut-collared Longspur	18	0.015	15.37 (6.3) 0.03–100	53.33 (6.39) 0–90	8.5 (3.31) 0–45	26.5 (7.38) 0–100	11.67 (2.52) 0–30	64.11 (4.7) 9–80	11 (3.67) 0–55	17.78 (2.96) 0–42	22 (3.59) 5–54
Gray Catbird	17	0.014	28.42 (9.58) 0.2–130	51 (6.11) 0–89	26.18 (4.57) 5–75	19.18 (5.73) 0–90	3.65 (1.64) 0–25	60 (3.38) 41–82	19.41 (3.57) 0–41	15.59 (1.93) 2–33	19.59 (1.86) 4–31
Northern Flicker	17	0.014	11.56 (5.39) 0.1–65	58.71 (7.26) 5–96	24.65 (6.99) 0–95	14.18 (4.48) 0–65	2.47 (0.86) 0–10	56.82 (5.11) 24–93	21.12 (5.39) 0–65	16.88 (2.21) 0–33	22.53 (2.78) 2–40
Orchard Oriole	16	0.013	10.82 (5.31) 0.05–65	39.25 (7.5) 0–85	25.88 (6.12) 0–85	25.5 (6.54) 0–80	3.13 (2.23) 0–35	60.56 (4.36) 23–83	16.81 (4.2) 0–60	16.88 (3) 4–53	24.63 (2.71) 10–51

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Bank Swallow	15	0.013	11.93 (4.9) 0.3–66	46.33 (7.2) 0–95	21.53 (6.27) 0–90	29.13 (7.39) 0–97	3 (1.18) 0–10	57 (5.71) 20–91	23.27 (6.32) 0–78	12.47 (3.16) 0–41	18.8 (3.4) 3–44
Baird's Sparrow	14	0.012	12.35 (6.07) 0.05–65	49.5 (8.09) 0–95	14.64 (5.33) 0–60	28.71 (8.27) 5–100	7.14 (3.5) 0–50	70.36 (4.83) 33–90	14.86 (4.42) 0–51	10.07 (1.66) 1–23	25.36 (2.8) 1–42
Western Grebe	13	0.011	38.02 (7.5) 3–75.1	75.62 (5.76) 40–100	10.62 (3.27) 0–40	10.38 (2.86) 0–30	3.38 (1.44) 0–16	47.38 (6.98) 3–84	22.92 (6.82) 0–70	24.08 (4.39) 10–53	16.08 (3.47) 1–51
Great Blue Heron	12	0.010	15.52 (4.61) 0.4–50	63.67 (8.7) 15–100	17.25 (5.82) 0–65	17.67 (6.12) 0–60	1.42 (0.89) 0–10	62.83 (6.69) 28–88	11.58 (5.58) 0–57	18.67 (3.59) 6–50	20.5 (3.47) 5–41
Least Flycatcher	12	0.010	14.88 (10.78) 0.2–130	47.5 (7.89) 0–85	17 (4.35) 0–40	30.92 (8.07) 0–90	4.58 (1.99) 0–20	64 (5.5) 20–84	21 (6.69) 0–78	11.33 (1.96) 0–22	23.58 (4.41) 3–58
Bufflehead	11	0.009	60.46 (17.87) 4.5–204.26	68.82 (6.17) 40–90	12.82 (4.11) 0–40	11.09 (3.16) 0–30	7.27 (2.96) 0–30	44.82 (6.14) 6–81	24.18 (7.24) 0–84	26.36 (6.11) 0–68	10.64 (2.35) 3–24
California Gull	11	0.009	17.79 (6.61) 0.81–60.73	68.45 (7.17) 30–100	10.64 (4.06) 0–37	12.91 (3.71) 0–35	8 (2.58) 0–30	49.82 (8.04) 9–81	19.45 (7.67) 0–65	24.18 (4.61) 7–53	16.45 (3.83) 5–49
Dickcissel	11	0.009	2.69 (1.08) 0.25–10	37.55 (11.65) 0–98	26.45 (10.86) 0–100	34.64 (11.16) 0–95	1.36 (0.92) 0–10	35.27 (5.06) 13–63	40 (5.68) 3–71	14.73 (2.2) 4–27	24.64 (1.86) 17–40
Red-tailed Hawk	11	0.009	25.6 (10.03) 0.05–100	62.27 (9.13) 0–95	14 (3.9) 0–35	11.91 (5.67) 0–65	2.73 (1.53) 0–15	59.27 (3.65) 34–82	20.09 (4.33) 0–49	15.27 (2.07) 10–28	21.64 (3.87) 8–55
Great Horned Owl	10	0.008	13.66 (5.11) 0.6–50	51.1 (9.11) 15–90	31.2 (8.59) 5–85	16.2 (6.41) 0–65	1.5 (1.07) 0–10	66.1 (5.35) 41–92	13.5 (4.55) 0–41	15.6 (2.64) 3–33	24.1 (3.64) 17–56
Northern Rough-winged Swallow	10	0.008	1.73 (0.57) 0.23–5.5	55.3 (12.47) 0–96	19.9 (8.93) 0–85	22.1 (9.41) 0–100	2.7 (1.5) 0–15	56.4 (5.14) 25–72	24.7 (5.65) 10–69	13.5 (3.23) 2–33	27.3 (3.9) 14–46
Piping Plover	10	0.008	32.39 (12.44) 0.5–100	60 (7.67) 0–80	5 (2.69) 0–25	18.5 (7.19) 0–70	16.5 (3.08) 5–30	42.4 (7.79) 5–79	22.8 (8.42) 0–67	27.7 (3.14) 8–42	16.4 (4.58) 5–53

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Brown Thrasher	9	0.008	21.4 (12.31) 0.39–100	45.56 (9.07) 5–85	23.44 (9.72) 1–95	24.67 (8.84) 0–77	6.33 (2.81) 0–25	61.22 (6.02) 30–82	20.33 (6.43) 0–50	12.78 (1.78) 7–24	19.56 (2.31) 8–26
Lesser Yellowlegs	9	0.008	15.57 (7.21) 0.8–70	45 (12.84) 0–92	24.22 (9.13) 0–80	24.89 (9.76) 2–90	5.89 (3.81) 0–35	41.89 (8.65) 3–77	33.11 (7.28) 13–70	19.67 (3.69) 4–42	18.11 (2.64) 8–32
Warbling Vireo	9	0.008	15.85 (14.28) 0.05–130	46.44 (11.67) 0–85	19.89 (8.39) 0–80	20.33 (7.79) 0–65	2.22 (2.22) 0–20	55.67 (6.91) 17–77	18.33 (5.56) 0–54	18.56 (2.9) 10–35	23.33 (6.03) 4–62
Cattle Egret	7	0.006	5.56 (2.33) 0.4–18	60.71 (11.41) 5–95	33.57 (12.57) 5–95	4.29 (2.3) 0–15	1.43 (1.43) 0–10	51.29 (11.48) 3–82	22.29 (10.02) 0–70	15.86 (2.35) 6–26	22.43 (2.5) 14–31
Forster's Tern	7	0.006	14.33 (6.69) 1–50	74.43 (7.38) 50–100	14.57 (6.52) 0–40	7.43 (2.11) 0–15	3.57 (3.57) 0–25	71.43 (7.77) 37–87	0.86 (0.86) 0–6	21.71 (6.39) 8–50	19.57 (3.58) 5–31
Cedar Waxwing	6	0.005	17.87 (10.6) 0.2–65	46 (12.16) 0–89	20.83 (5.35) 7–40	32.33 (13.22) 4–90	0.83 (0.83) 0–5	63.33 (6.38) 44–82	20.33 (7.26) 0–40	12.17 (2.14) 7–22	22.83 (2.3) 16–31
Red-necked Grebe	6	0.005	29.54 (11.29) 3.24–64	59.83 (7) 40–90	19.33 (5.08) 5–35	17.5 (4.61) 5–30	3.33 (1.67) 0–10	71.67 (4.3) 51–81	7.83 (5.02) 0–32	15.83 (1.45) 13–22	16 (2.85) 7–28
Vesper Sparrow	6	0.005	14.18 (9.83) 0.03–60.73	40.83 (15.62) 0–90	7.5 (3.59) 0–20	32.5 (16.01) 0–100	2.5 (1.71) 0–10	68 (12.68) 16–90	12.83 (12.83) 0–77	15.5 (7.54) 5–53	25.67 (4.25) 10–41
Great Egret	5	0.004	11.12 (5.21) 0.2–30	86 (3.67) 75–95	7 (2.55) 0–15	4 (1.87) 0–10	3 (2) 0–10	62.6 (10.24) 29–81	14.4 (9.37) 0–46	17.6 (1.12) 15–20	26.2 (2.08) 18–29
Hooded Merganser	5	0.004	49.25 (17.41) 1.5–100	67 (8.6) 40–90	7 (3.39) 0–20	17 (5.83) 0–30	9 (4.58) 0–25	55.2 (8.17) 34–80	14.2 (7.63) 0–36	25 (7.6) 8–53	9.6 (3.91) 1–24
Least Sandpiper	5	0.004	21.45 (12.57) 0.49–60.73	47 (9.43) 20–75	24 (10.3) 0–60	22 (4.06) 10–30	7 (2) 0–10	55.8 (6.21) 42–74	13.4 (7.08) 0–35	26.2 (8.24) 4–53	16.2 (8.05) 5–48
Short-eared Owl	5	0.004	20.36 (19.91) 0.02–100	37 (11.36) 0–60	21 (12.29) 0–60	34 (16.39) 0–85	8 (5.15) 0–25	66 (13.31) 15–87	16 (11.58) 0–61	10.4 (3.59) 4–24	22.8 (5.17) 8–40

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Bullock's Oriole	4	0.003	5.7 (4.77) 0.6–20	51.25 (20.45) 0–100	33.75 (19.08) 0–80	6.25 (6.25) 0–25	8.75 (5.15) 0–20	56.75 (14.06) 17–83	22.25 (11.88) 0–54	13.75 (5.11) 4–28	27.25 (12.82) 6–62
Spotted Sandpiper	4	0.003	82.07 (45.83) 4–204.26	80 (9.13) 60–100	1.25 (1.25) 0–5	8.5 (4.35) 0–20	10.25 (5.33) 0–25	43 (14.02) 9–66	13.75 (13.75) 0–55	38 (10.13) 24–68	9 (3.49) 3–19
American Redstart	3	0.003	0.97 (0.19) 0.6–1.2	46.67 (24.89) 0–85	30.67 (24.67) 5–80	11 (7.37) 0–25	11.67 (6.01) 0–20	51 (17.47) 17–75	26.67 (15.59) 0–54	15 (3.61) 10–22	44.33 (9.21) 31–62
Common Nighthawk	3	0.003	34.17 (32.92) 1.1–100	61.67 (13.02) 40–85	14.33 (8.35) 5–31	15.67 (6.69) 8–29	8.33 (8.33) 0–25	70.67 (2.6) 66–75	7 (7) 0–21	15.67 (7.36) 1–24	17.67 (11.2) 5–40
Gray Partridge	3	0.003	3.78 (3.11) 0.55–10	5 (2.89) 0–10	13.67 (13.17) 0–40	48 (25.93) 0–89	1.67 (1.67) 0–5	43.67 (12.45) 19–59	34.67 (15.17) 19–65	10 (4.73) 3–19	25.33 (3.84) 21–33
Greater Yellowlegs	3	0.003	3.64 (3.04) 0.4–9.72	73.33 (6.01) 65–85	11.67 (4.41) 5–20	6.67 (4.41) 0–15	8.33 (1.67) 5–10	70 (6.11) 62–82	11.67 (4.98) 4–21	11 (4.36) 4–19	20.33 (1.86) 18–24
House Sparrow	3	0.003	24.68 (19.67) 4.05–64	44.67 (21.76) 5–80	28.67 (19.15) 0–65	23 (6.51) 10–30	3.67 (3.18) 0–10	45.67 (17.33) 15–75	30 (12.5) 7–50	19.33 (3.93) 14–27	19 (6.11) 7–27
Least Bittern	3	0.003	3.93 (2.56) 0.8–9	16.67 (9.28) 5–35	55 (14.43) 30–80	28.33 (15.9) 10–60	0 (0) 0–0	40 (17.21) 15–73	32 (16.04) 0–50	23.67 (2.4) 19–27	34 (11.24) 19–56
Swainson's Hawk	3	0.003	4.03 (2.5) 1.1–9	53.33 (26.82) 0–85	7.33 (1.45) 5–10	36 (29.51) 5–95	3.33 (3.33) 0–10	77 (3.06) 73–83	1.33 (1.33) 0–4	17.33 (3.71) 10–22	31.33 (4.48) 25–40
American Crow	2	0.002	4.35 (4.15) 0.2–8.5	47.5 (47.5) 0–95	0 (0.00) 0–0	50 (50) 0–100	2.5 (2.5) 0–5	66.5 (12.5) 54–79	18 (18) 0–36	12 (6) 6–18	25.5 (6.5) 19–32
Downy Woodpecker	2	0.002	2.6 (2.21) 0.39–4.8	50 (0) 50–50	17.5 (17.5) 0–35	25 (15) 10–40	7.5 (2.5) 5–10	39 (14) 25–53	47.5 (11.5) 36–59	10 (1) 9–11	30.5 (6.5) 24–37
Red-eyed Vireo	2	0.002	0.7 (0.5) 0.2–1.2	30 (25) 5–55	10 (5) 5–15	52.5 (27.5) 25–80	7.5 (7.5) 0–15	71.5 (10.5) 61–82	16.5 (9.5) 7–26	9.5 (0.5) 9–10	28.5 (2.5) 26–31

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White-faced Ibis	2	0.002	7.5 (0.5) 7–8	22.5 (17.5) 5–40	37.5 (2.5) 35–40	40 (20) 20–60	0 (0) 0–0	48 (2) 46–50	10.5 (3.5) 7–14	35.5 (0.5) 35–36	24.5 (3.5) 21–28
White-rumped Sandpiper	2	0.002	12.7 (12.3) 0.4–25	52.5 (2.5) 50–55	22.5 (7.5) 15–30	15 (15) 0–30	10 (10) 0–20	38.5 (36.5) 2–75	44.5 (44.5) 0–89	14.5 (7.5) 7–22	26 (11) 15–37
Yellow-rumped Warbler	2	0.002	37.62 (23.12) 14.5–60.73	62.5 (22.5) 40–85	15 (5) 10–20	16.5 (13.5) 3–30	6 (4) 2–10	51.5 (8.5) 43–60	12.5 (12.5) 0–25	32.5 (20.5) 12–53	17 (7) 10–24
Belted Kingfisher	1	0.001	5.5 (–) 5.5–5.5	94 (–) 94–94	2 (–) 2–2	0 (–) 0–0	4 (–) 4–4	58 (–) 58–58	20 (–) 20–20	17 (–) 17–17	18 (–) 18–18
Blackpoll Warbler	1	0.001	1.2 (–) 1.2–1.2	55 (–) 55–55	5 (–) 5–5	25 (–) 25–25	15 (–) 15–15	61 (–) 61–61	26 (–) 26–26	10 (–) 10–10	31 (–) 31–31
Brewer's Blackbird	1	0.001	4 (–) 4–4	0 (–) 0–0	10 (–) 10–10	80 (–) 80–80	10 (–) 10–10	74 (–) 74–74	21 (–) 21–21	3 (–) 3–3	21 (–) 21–21
Canada Warbler	1	0.001	1.1 (–) 1.1–1.1	85 (–) 85–85	7 (–) 7–7	8 (–) 8–8	0 (–) 0–0	75 (–) 75–75	0 (–) 0–0	22 (–) 22–22	40 (–) 40–40
Chipping Sparrow	1	0.001	60.73 (–) 60.73–60.73	40 (–) 40–40	20 (–) 20–20	30 (–) 30–30	10 (–) 10–10	43 (–) 43–43	0 (–) 0–0	53 (–) 53–53	10 (–) 10–10
Common Goldeneye	1	0.001	32 (–) 32–32	50 (–) 50–50	40 (–) 40–40	10 (–) 10–10	0 (–) 0–0	44 (–) 44–44	40 (–) 40–40	11 (–) 11–11	16 (–) 16–16
Common Tern	1	0.001	60 (–) 60–60	50 (–) 50–50	45 (–) 45–45	5 (–) 5–5	0 (–) 0–0	61 (–) 61–61	10 (–) 10–10	26 (–) 26–26	6 (–) 6–6
Eastern Bluebird	1	0.001	5 (–) 5–5	89 (–) 89–89	7 (–) 7–7	4 (–) 4–4	0 (–) 0–0	72 (–) 72–72	0 (–) 0–0	22 (–) 22–22	31 (–) 31–31
Eastern Wood Pewee	1	0.001	1.1 (–) 1.1–1.1	85 (–) 85–85	7 (–) 7–7	8 (–) 8–8	0 (–) 0–0	75 (–) 75–75	0 (–) 0–0	22 (–) 22–22	40 (–) 40–40

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Ferruginous Hawk	1	0.001	4.86 (–) 4.86–4.86	60 (–) 60–60	10 (–) 10–10	20 (–) 20–20	10 (–) 10–10	88 (–) 88–88	0 (–) 0–0	7 (–) 7–7	12 (–) 12–12
Great Crested Flycatcher	1	0.001	0.6 (–) 0.6–0.6	0 (–) 0–0	80 (–) 80–80	0 (–) 0–0	20 (–) 20–20	17 (–) 17–17	54 (–) 54–54	13 (–) 13–13	62 (–) 62–62
Great-tailed Grackle	1	0.001	7 (–) 7–7	40 (–) 40–40	40 (–) 40–40	20 (–) 20–20	0 (–) 0–0	46 (–) 46–46	14 (–) 14–14	35 (–) 35–35	28 (–) 28–28
Lark Sparrow	1	0.001	0.4 (–) 0.4–0.4	55 (–) 55–55	40 (–) 40–40	0 (–) 0–0	5 (–) 5–5	29 (–) 29–29	65 (–) 65–65	0 (–) 0–0	2 (–) 2–2
Purple Martin	1	0.001	4 (–) 4–4	10 (–) 10–10	0 (–) 0–0	90 (–) 90–90	0 (–) 0–0	43 (–) 43–43	30 (–) 30–30	24 (–) 24–24	32 (–) 32–32
Rock Pigeon	1	0.001	0.2 (–) 0.2–0.2	10 (–) 10–10	80 (–) 80–80	10 (–) 10–10	0 (–) 0–0	16 (–) 16–16	75 (–) 75–75	5 (–) 5–5	17 (–) 17–17
Semipalmated Sandpiper	1	0.001	4 (–) 4–4	10 (–) 10–10	0 (–) 0–0	90 (–) 90–90	0 (–) 0–0	43 (–) 43–43	30 (–) 30–30	24 (–) 24–24	32 (–) 32–32
Sharp-tailed Grouse	1	0.001	0.4 (–) 0.4–0.4	50 (–) 50–50	10 (–) 10–10	30 (–) 30–30	10 (–) 10–10	81 (–) 81–81	0 (–) 0–0	16 (–) 16–16	13 (–) 13–13
Snow Goose	1	0.001	44.53 (–) 44.53–44.53	60 (–) 60–60	10 (–) 10–10	25 (–) 25–25	5 (–) 5–5	14 (–) 14–14	0 (–) 0–0	82 (–) 82–82	1 (–) 1–1
Snowy Egret	1	0.001	5.5 (–) 5.5–5.5	50 (–) 50–50	50 (–) 50–50	0 (–) 0–0	0 (–) 0–0	82 (–) 82–82	0 (–) 0–0	15 (–) 15–15	31 (–) 31–31
Sprague's Pipit	1	0.001	64 (–) 64–64	80 (–) 80–80	5 (–) 5–5	15 (–) 15–15	0 (–) 0–0	53 (–) 53–53	29 (–) 29–29	16 (–) 16–16	1 (–) 1–1
Tennessee Warbler	1	0.001	10.93 (–) 10.93–10.93	75 (–) 75–75	0 (–) 0–0	0 (–) 0–0	25 (–) 25–25	41 (–) 41–41	26 (–) 26–26	26 (–) 26–26	11 (–) 11–11

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Veery	1	0.001	1.2 (–) 1.2–1.2	20 (–) 20–20	75 (–) 75–75	5 (–) 5–5	0 (–) 0–0	63 (–) 63–63	29 (–) 29–29	2 (–) 2–2	15 (–) 15–15
White Ibis	1	0.001	5.47 (–) 5.47–5.47	25 (–) 25–25	65 (–) 65–65	8 (–) 8–8	2 (–) 2–2	77 (–) 77–77	3 (–) 3–3	14 (–) 14–14	11 (–) 11–11
Wilson's Warbler	1	0.001	1.1 (–) 1.1–1.1	85 (–) 85–85	7 (–) 7–7	8 (–) 8–8	0 (–) 0–0	75 (–) 75–75	0 (–) 0–0	22 (–) 22–22	40 (–) 40–40
Wood Thrush	1	0.001	1.2 (–) 1.2–1.2	55 (–) 55–55	5 (–) 5–5	25 (–) 25–25	15 (–) 15–15	61 (–) 61–61	26 (–) 26–26	10 (–) 10–10	31 (–) 31–31

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