Breeding Bird Survey of a Farmland Acquisition Site Prior to Habitat Restoration

Report to the Iowa Ornithologists' Union

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Summary

Bird surveys (n = 9), consisting of point counts and area searches, were conducted by a single observer at regular intervals throughout the spring and summer of 2014 at Prairie Creek Recreation Area (PCRA), Maquoketa, Iowa, to provide baseline information about the avifauna of this newly-acquired site. In total, 99 species were detected at PCRA, with 21 species confirmed as breeding at the site, an additional 26 species considered as probable breeders, and 11 other species listed as possible breeders. Both species richness and species diversity were low in the early spring but increased dramatically during the peak northward passerine migration in mid-May and then declined again over the summer. The ten most abundant species recorded during the three area surveys conducted during the breeding season (26 May, 3 June, 2 July) were (in order): House Wren, Canada Goose, Barn Swallow, Northern Cardinal, Field Sparrow, Red-winged Blackbird, American Robin, American Goldfinch, Song Sparrow, and Gray Catbird. Among these species, only Canada Goose and American Goldfinch were unconfirmed as breeding species at the site, with CAGO a visiting transient species and AMGO considered a probable breeder.The point-count surveys resulted in 47 species, the nine most abundant (in terms of density) being House Wren, Northern Cardinal, Red-winged Blackbird, Field Sparrow, American Goldfinch, Song Sparrow, Gray Catbird, Eastern Wood-Pewee, and Indigo Bunting. In general, there was high concordance between the area surveys and the point-count surveys. Model-based estimates of site occupancy and abundance indicated that naïve estimates of these metrics derived from raw counts were biased downward for some species, although the two methods were in fairly close agreement for highly vocal species such as House Wren, Song Sparrow, and Eastern Wood-Pewee.During spring and autumn migration, 19 species of warblers were detected at PCRA, but only Common Yellowthroat and Yellow Warbler remained to breed. With the exception of Red-eyed Vireo and Scarlet Tanager, no deep forest-interior species were recorded during breeding season by either survey method. Likewise, with the exception of Red-winged Blackbird, Song Sparrow, and Field Sparrow, grassland-dependent bird species were scarce or absent entirely. A few sensitive grassland species (e.g., Grasshopper Sparrow, Lark Sparrow, Dickcissel, Bobolink) were recorded on some occasions, but probably did not have adequate resources to breed.

Introduction

In January of 2014, the Martin farmstead, a 273-acre tract of cropland, meadow and woodland, was ceded to the Jackson County Conservation Board (JCCB), which agreed to administer the property for public use. The site subsequently was renamed Prairie Creek Recreation Area (Fig. 1) after the name of the stream that bisects the property. The JCCB intends to draft a management and conservation plan for this property, but implementation of the full plan will be gradual, because of a five-year lease granted for continued farming (cropping consists of corn and soybeans). In the future, the JCCB intends to restore native tallgrass prairie vegetation in areas that currently are under crop production.

In anticipation of the transition, the JCCB is interested in gathering as much biological information about the existing ecosystems to provide baseline data by which to gauge the success of future management efforts. One initial objective was to conduct bird surveys of the site to develop an inventory of the diversity and numbers of birds using the site for breeding and on migration.

Figure 1. Prairie Creek Recreation Area, Maquoketa, Iowa.

Methods

In the early spring of 2014, Ann Burns, Jessica Wagner (both of the JCCB), and Dave Shealer (Avian Ecologist from Loras College in Dubuque, Iowa) walked the property to survey the various habitats and to establish sites for permanent point count surveys of birds. Initially, the thought was to use random site selection, but upon further discussion, we decided that this method would likely result in the establishment of most points in cropland slated for farming over the next five years. Consequently, we decided instead to establish the point-count sites deliberately, such that both meadow (unfarmed) and woodland habitats would be represented approximately equally. To reduce potential error from double counting individual birds, plots were established such that the outer edge of each was at least 100 m from the edge of the nearest plot. The precise latitude and longitude of each site (n = 17 sites total; one site not surveyed in 2014) was recorded with a GPS unit, and the general habitat type was classified as either meadow or woodland (Table 1), depending on the dominant vegetation within a 50-m radius of the center of the point. Cropland habitat was not considered for surveying at this time. The center of each survey point was marked with a wooden stake driven into the ground and orange surveyors' flagging tied to the top of the stake.

Table 1. Latitude and longitude of the center of each fixed-radius plot in the point-count survey and general habitat characteristic.

Point	Latitude (N)	Longitude (W)	Habitat
1	42.06088	-90.64628	Meadow
2	42.06010	-90.64465	Meadow
3	42.05888	-90.64089	Meadow
4	42.05904	-90.64232	Meadow
5	42.06181	-90.64339	Meadow
6	42.05810	-90.64500	Woodland
7*	42.06422	-90.64021	Woodland
8	42.05310	-90.63655	Woodland
9	42.05505	-90.63966	Woodland
10	42.05494	-90.64139	Woodland
11	42.05880	-90.63823	Meadow
12	42.06038	-90.63840	Meadow
13	42.06031	-90.63982	Woodland
14	42.05710	-90.63512	Woodland
15	42.05611	-90.63513	Woodland
16	42.05463	-90.63351	Meadow
17	42.05244	-90.63257	Meadow

*This point was not surveyed in 2014; access necessitates crossing private property.

Between 13 May and 2 July, five point-count surveys were conducted at PCRA. A survey consisted of a single observer walking to the designated point and recorded all species of birds seen and heard for 5 minutes within a circle with a fixed-radius plot of 50 m The observer mapped the location of all species on a data sheet (after Ralph et al. 1993) for later transcription and analysis. Species recorded as being outside the plot circle or flying over the circle were recorded also but were not included in the data analysis for the point count survey. Each point count survey was begun shortly after sunrise (usually

between 06:00 and 07:00), and the order in which the points were visited was alternated between visits to attempt to control for temporal differences in species detection throughout the morning hours. For the purposes of this analysis we consider three of the point-count dates (26 May, 3 June, 2 July) to represent the breeding season, such that birds detected in the count circles during those dates were assumed to be holding territories.

In addition to the point counts, complete area searches were conducted on eight dates between 31 March and 11 September, including on the five dates of the point count surveys. Here, the observer recorded all birds seen and heard while on the property, including during the point counts and when walking between points. The path the observer walked during area searches was consistent and covered the same total distance each time, although the direction of travel differed between surveys to accommodate the point count protocols.

During both the point-count and area search surveys, we recorded evidence of breeding by the species detected. Criteria used as confirmed evidence of breeding included (1) finding a nest, (2) observing adults carrying food, or (3) observing recently fledged young. Criteria considered evidence of probable breeding at the site included (1) agitated behavior by one or both members of a pair, or (2) a singing male recorded at the same location in a point-count circle on at least two of the three count dates during the breeding season. The criterion used to designate possible breeding was the detection of a male and female during the breeding season in appropriate habitat (either grassland or forest).

For area count surveys, species richness on each date was defined as the total number of different species detected. Species diversity was calculated with Simpson's Reciprocal Index,

$$D = 1/\Sigma p_i^2,$$

where the denominator represents the sum of the squares of the proportion of each species in the sample. Values for this index may range from 1 (lowest diversity) to *S*, or the number of species in the sample (= species richness).

For point count surveys during the breeding season, species density was calculated as the total number of different singing males (or pairs observed) across all 16 point-count circles, divided by the total area of coverage, which was 125,664 m^2 ($\pi[50]^2$ * 16 plots) or 12.56 hectares. For each species detected during the breeding season, density is expressed as number of individuals per hectare.

We also generated model-based estimates of site occupancy and abundance, using the software program PRESENCE (Hines 2006). For each species, two models were fitted to the encounter data to estimate site occupancy: one with a constant detection-probability assumed across the survey period and a second with detection probability modeled as survey-specific. Model selection was based on Akaike's Information Criterion (AIC) and likelihood ratio tests between models. For estimates of abundance, we used the Royle-Nichols N-mixture modeling approach described by Royle (2004).

Results and Discussion

Based on results from the area count surveys, species richness was low in late March and early May, but increased dramatically in mid-to late May (Fig. 2), as the pulse of northbound migrant passerines passed

through. Species diversity very closely reflected the pattern of species richness throughout the spring and summer (Pearson's *r* = 0.86, n = 8, P = 0.006).

A total of 99 species was recorded on eight complete area surveys in 2014. These checklists, including total numbers of each species recorded during each survey, as well as effort information, are in the public domain and are available for retrieval on eBird (www.eBird.org). Checklists can be accessed by clicking on the "Explore Data" menu, then "Explore Hotspots." Enter the name of the Hotspot (PCRA is listed as "Prairie Creek Preserve, Jackson, US-IA" in the Hotspot Explorer). From here, one can access individual checklists or view bar charts with year-round summaries of species occurrences at this site.

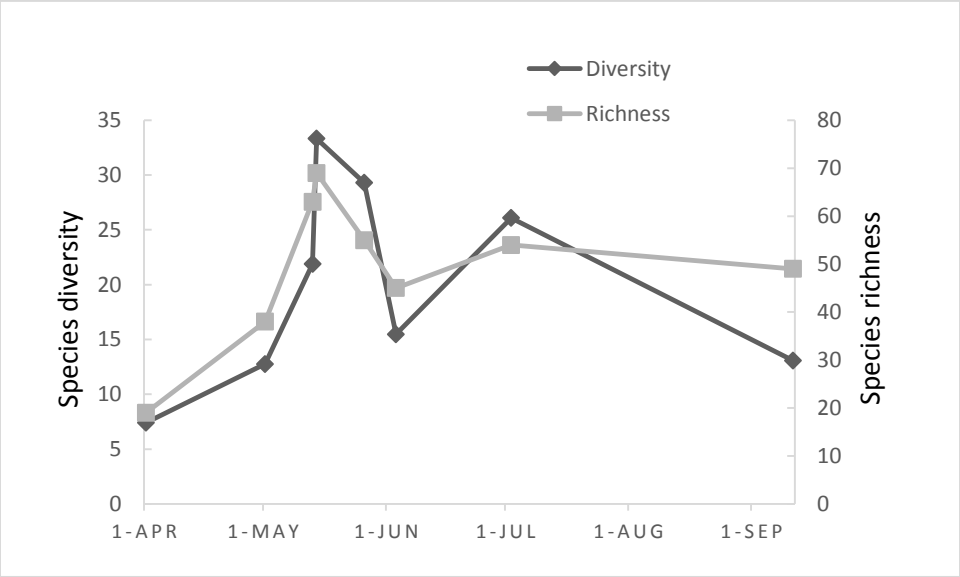

Figure 2. Bird species richness and species diversity (Simpson's Reciprocal Index) over the spring and summer, 2014, at Prairie Creek Recreation Area.

Forty-seven species of birds were detected on the point-count surveys during the breeding season (Appendix I). The most abundant species, in terms of density, either were species associated with forest/field ecotones (e.g., House Wren, Northern Cardinal, Gray Catbird, Eastern Wood-Pewee, Indigo Bunting), or grassland species (e.g., Red-winged Blackbird, Field Sparrow, Song Sparrow, Common Yellowthroat). With the exception of Red-eyed Vireo and Scarlet Tanager, no deep forest interior species were recorded on the point count surveys, likely because of the narrow linear orientation of the wooded areas on this property.

Model-based analysis indicated that estimates of site occupancy and abundance were biased downward, due mostly to imperfect detection (Table 2). For highly vocal species, such as House Wren, Song Sparrow, and Eastern Wood-Pewee, the naïve estimators of site occupancy were fairly close to the adjusted model-based estimates. For other, less vocal species, the naïve estimators were 10-20% lower than the model-based estimates. The Royle-Nichols abundance models performed poorly in estimating true abundance (Table 2), primarily because of small sample sizes which resulted in high standard errors around the estimate. In some cases, abundance was not estimable.

Table 2. Naïve and model-based estimates of site occupancy (proportion of count circles occupied), detection probability, and abundance for seven of the most abundant species at Prairie Creek Recreation Area in the spring and summer of 2014.

		Site occupancy			Detection probability					
					26 May		3 June		2 July	
Species	Model	Naïve	Ψ	SE	p	SE	p	SE	p	SE
House Wren	p(.)	0.81	0.89	0.12	0.56	0.09				
	p(survey)	0.81	0.87	0.11	0.36	0.13	0.72	0.14	0.65	0.14
	Abundance	18	40.85	27.59						
Northern Cardinal	p(.)	0.56	0.70	0.19	0.41	0.12				
	Abundance	18	not estimable							
Red-winged Blackbird	p(.)	0.38	0.44	0.15	0.48	0.15				
	Abundance	13	18.93	6.98						
Field Sparrow	p(.)	0.56	0.78	0.24						
	p(survey)	0.56	0.75	0.23	0.25	0.14	0.33	0.16	0.50	0.20
	Abundance	11	49.9	80.2						
Song Sparrow	p(.)	0.44	0.46	0.13	0.63	0.12				
	p(survey)	0.44	0.45	0.13	0.69	0.18	0.83	0.15	0.42	0.19
	Abundance	10	12.5	4.6						
Gray Catbird	p(.)	0.56	0.70	0.19	0.41	0.12				
	Abundance	9	17.1	12.0						
Eastern Wood-Pewee	p(.)	0.50	0.60	0.17	0.45	0.13				
	Abundance	8	12.2	6.5						

Unmet objectives in 2014

We were unable to conduct vegetation surveys in our point-count circles this year but hope to do so in 2015 before any significant habitat restoration plans are enacted. Consequently, we were unable to model species occurrence or abundance in association with vegetation characteristics of the habitats we surveyed

Acknowledgments

We thank the Iowa Ornithologists' Union for a grant to cover the costs of conducting the bird surveys at PCRA in 2014.

References

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Appendix I. List of species detected on three point-count surveys during the breeding season, their breeding status (see Methods for criteria), the unadjusted high count totals for the 16 count circles, and maximum density (number per hectare).

Common Name	Binomen	Status	High count	Density (#/ha)
House Wren	*Troglodytes aedon*	Confirmed	18	1.43
Northern Cardinal	*Cardinaliscardinalis*	Confirmed	18	1.43
Red-winged Blackbird	*Agelaiusphoeniceus*	Confirmed	13	1.04
Field Sparrow	*Spizellapusilla*	Confirmed	11	0.88
American Goldfinch	*Carduelistristis*	Probable	11	0.88
Song Sparrow	*Melospizamelodia*	Confirmed	10	0.80
Gray Catbird	*Dumetellacarolinensis*	Confirmed	9	0.72
Eastern Wood-Pewee	*Contopusvirens*	Probable	8	0.64
Indigo Bunting	*Passerinacyanea*	Probable	8	0.64
White-breasted Nuthatch	*Sittacarolinensis*	Confirmed	7	0.56
Common Yellowthroat	*Geothlypistrichas*	Confirmed	7	0.56
Rose-breasted Grosbeak	*Pheucticusludovicianus*	Probable	7	0.56
American Robin	*Turdusmigratorius*	Confirmed	6	0.48
Downy Woodpecker	*Picoidespubescens*	Confirmed	5	0.40
Baltimore Oriole	*Icterus galbula*	Probable	5	0.40
Great Crested Flycatcher	*Myiarchuscrinitus*	Probable	4	0.32
Tufted Titmouse	*Baeolophus bicolor*	Probable	4	0.32
Brown Thrasher	*Toxostomarufrum*	Probable	4	0.32
Brown-headed Cowbird	*Molothrusater*	Confirmed	4	0.32
Eastern Phoebe	*Sayornis phoebe*	Confirmed	3	0.24
Eastern Kingbird	*Tyrannustyrannus*	Confirmed	3	0.24
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Probable	3	0.24
Common Grackle	*Quiscalusquiscula*	Confirmed	3	0.24
Red-bellied Woodpecker	*Melanerpescarolinus*	Confirmed	2	0.16
Willow Flycatcher	*Empidonaxtraillii*	Possible	2	0.16
Red-eyed Vireo	*Vireoolivaceus*	Probable	2	0.16
Blue Jay	*Cyanocittacristata*	Probable	2	0.16
Black-capped Chickadee	*Poecileatricapilla*	Confirmed	2	0.16
Blue-gray Gnatcatcher	*Polioptilacaerulea*	Probable	2	0.16
Eastern Bluebird	*Sialiasialis*	Probable	2	0.16
Yellow Warbler	*Dendroicapetechia*	Confirmed	2	0.16
Chipping Sparrow	*Spizellapasserina*	Probable	2	0.16
Grasshopper Sparrow	*Ammodramus savannarum*	Probable	2	0.16
Scarlet Tanager	*Pirangaolivacea*	Possible	2	0.16
Dickcissel	*Spizaamericana*	Probable	2	0.16
Bobolink	*Dolichonyxoryzivorus*	Possible	2	0.16
House Finch	*Carpodacusmexicanus*	Unlikely	2	0.16
Wild Turkey	*Meleagrisgallopavo*	Probable	1	0.08
Red-tailed Hawk	*Buteojamaicensis*	Confirmed	1	0.08
Yellow-billed Cuckoo	*Coccyzusamericanus*	Unlikely	1	0.08

Appendix I, (continued).

Common Name	Binomen	Status	High count	Density (#/ha)
Red-headed Woodpecker	*Melenerpes erythrocephalus*	Probable	1	0.08
Yellow-bellied Sapsucker	*Sphyrapicusvarius*	Unlikely	1	0.08
Yellow-throated Vireo	*Vireoflavifrons*	Probable	1	0.08
Warbling Vireo	*Vireogilvus*	Probable	1	0.08
Barn Swallow	*Hirundorustica*	Confirmed	1	0.08
American Redstart	*Setophagaruticilla*	Probable	1	0.08
Orchard Oriole	*Icterus spurius*	Unlikely	1	0.08