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Point counts surveys of land birds at the Four Canyon Preserve, Ellis County, Oklahoma, 2014

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ABSTRACT.—Standardized point counts were used to quantify the relative abundance and diversity of birds in three distinct terrestrial habitats at the Four Canyon Preserve, a mixed-grass prairie natural area in northwestern Oklahoma. Surveys conducted in 2014 detected 38 species including most breeding birds expected to occur at the site. Relative abundance and frequency of occurrence were calculated for species observed, and total relative abundance and mean species richness were calculated for habitats and for the Preserve as a whole. Total abundance and mean species richness were highest for wooded canyon and lowest for upland grassland habitats. Results were compared with years 2005 and 2007 assessments to identify potential changes in the avifauna of the Preserve. Increases were noted for Cassin's Sparrow (*Aimophila cassinii*), Western Meadowlark (*Sturnella neglecta*), and Northern Bobwhite (*Colinus virginianus*).

INTRODUCTION

The Four Canyon Preserve encompasses 1,615 ha of mixed-grass prairie, canyon, and floodplain habitats along the Canadian River in southern Ellis County, Oklahoma. Since establishing the Preserve in 2004, The Nature Conservancy has implemented an ambitious management plan designed to restore ecological processes and enhance habitats for a broad suite of wildlife species, including at-risk birds such as the Interior Least Tern (*Sterna antillarum athalassos*) and the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) (Hise and Tejan 2005). Year-round avifaunal surveys in 2005 and 2007 documented the presence of 126 bird species and characterized breeding activity at the site (Patten et al. 2006, Reinking and Patten 2007). Since completion of these inventories, quantitative bird monitoring has been limited to seasonal student research on individual taxa and focused annual surveys for shorebirds.

To improve understanding of bird use in terrestrial habitats at the Preserve, I implemented a modest, repeatable monitoring protocol based on point counts. Specific objectives of this effort were to:

1) Quantify diversity and relative abundance of land birds during the breeding season
2) Compare results with previous avian assessments
3) Establish a baseline for continued research
4) Provide raw data for other studies of birds in the mixed-grass prairie region of Oklahoma

METHODS

A stratified random sampling design was used to select 18 survey locations on the Preserve (Figure 1) from a 100 m grid overlay. Points located on steep slopes were excluded from the selection process for safety and logistical reasons. Strata were based on habitat to achieve constant sampling effort across types. Habitats include upland grassland characterized by little bluestem (*Shizachyrium scoparium*) and blue grama (*Bouteloua gracilis*) with scattered shrubs, wooded canyon areas supporting gallery forests of chinquapin oak (*Quercus muhlenbergii*) and eastern redcedar (*Juniperus virginiana*), and floodplain comprised of cottonwood (*Populus deltoides*) savanna and riparian wetlands. Sixteen of the selected locations are coincident with previously established, long-term vegetation monitoring transects (Chris Hise, unpublished data) for which yearly plant species composition and visual obstruction measurements are available.

Point counts incorporating elements of standard field methods (Ralph et al. 1995, Hanni et al. 2012) were conducted at survey locations in each habitat type. All birds observed within a 100 m radius over a 10 min period were identified and counted. Time, horizontal distance, compass bearing, identification method(s), and sex (if known) were recorded for each bird observation to permit future estimates of detection probability (Farnsworth et al. 2005) and to facilitate comparison with data from other studies collected using different protocols. Each point was surveyed twice during the 2014 breeding season, once in late May and again in mid-June. Surveys were conducted during fair weather conditions between sunrise and 0845 hours central daylight time. Additional species audible beyond the survey radius were noted during each count to document the occurrence of uncommon birds and to ensure focused listening by the observer.

For all species observed within 100 m, I calculated relative abundance and frequency of occurrence in each of the three habitat types and for the Preserve as a

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unit. Relative abundance is defined as the number of individuals counted divided by the total number of surveys. Frequency of occurrence is defined as the number of points at which a species occurred divided by the total number of survey locations. Mean species richness for habitats and for the Preserve were calculated based on the number of species observed within 100 m of sampling locations assigned to each strata.

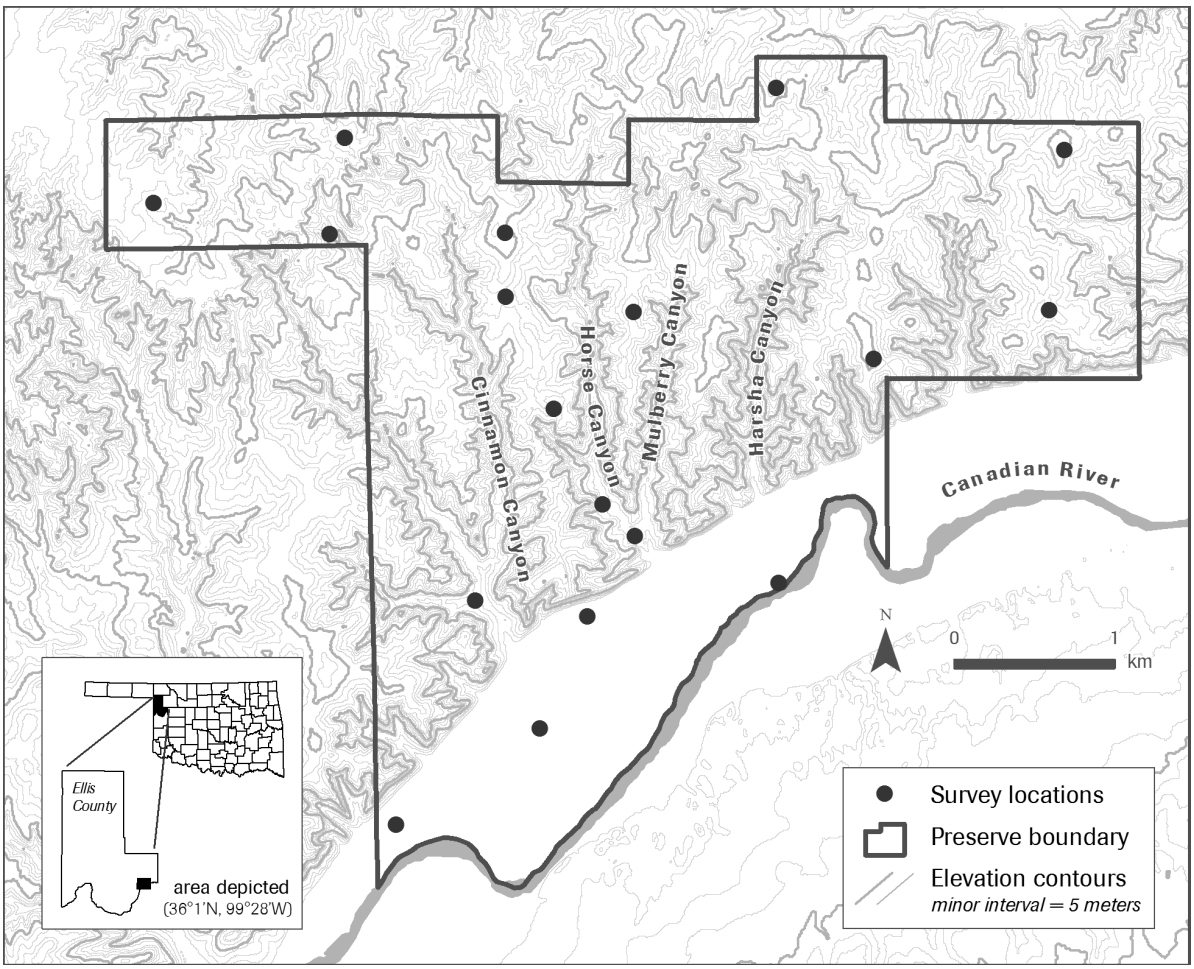

FIG. 1. Map of 2014 point count survey locations at the Four Canyon Preserve.

RESULTS AND DISCUSSION

A total of 154 individuals of 33 species were recorded during point counts, and 38 species were noted overall (Table 1); the latter figure includes approximately 60% of the bird species expected to breed in terrestrial habitats on the Preserve. Of the expected breeding species not detected during my surveys, most are considered rare in the area (Patten et al. 2006) or are poorly censused by point count methods (Ralph et al. 1995). The nine most frequently encountered species were detected at >25% of survey points; in contrast, 22 species were detected at two or fewer points, indicating patchy distributions of these species across the Preserve. Total relative abundance and mean species richness were highest for wooded canyon and lowest for upland grassland habitats (Table 2).

Relative abundance and frequency of occurrence for species detected during point counts are listed in Table 2, with year 2005 summer status codes assigned by Patten et al. (2006) provided for reference. While direct comparison of my results with previous assessments was confounded by differences in survey methods, a cursory examination of the data suggests the seasonal avifaunal composition of the Preserve remains largely unchanged.

Cassin's Sparrow was frequently encountered in upland areas during my surveys, particularly at sites characterized by shortgrass vegetation. This species was considered rare by Patten et al. (2006) and was not observed during follow-up surveys by Reinking and Patten (2007). Large annual fluctuations in local numbers and irregular breeding distributions are noted for

TABLE 1. Breeding birds of the Four Canyon Preserve (modified from Reinking and Patten 2007).

Common Name	Scientific Name	Observed in 2014[1]	Species of Conservation Concern[2]	TNC Target[3]
Scaled Quail	*Callipepla squamata*		•	•
Northern Bobwhite	*Colinus virginianus*	X	•	•
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*		•	•
Wild Turkey	*Meleagris gallopavo*	X		•
Green Heron	*Butorides virescens*			
Turkey Vulture	*Cathartes aura*	X		
Mississippi Kite	*Ictinia mississippiensis*		•	•
Red-tailed Hawk	*Buteo jamaicensis*	X		
Killdeer	*Charadrius vociferus*	X		
Interior Least Tern	*Sterna antillarum athalassos*		•	•
Mourning Dove	*Zenaida macroura*	X		
Yellow-billed Cuckoo	*Coccyzus americanus*	X		
Greater Roadrunner	*Geococcyx californianus*			
Great Horned Owl	*Bubo virginianus*			
Common Nighthawk	*Chordeiles minor*	X		
Red-bellied Woodpecker	*Melanerpes carolinus*	X		
Belted Kingfisher	*Ceryle alcyon*	X		
Downy Woodpecker	*Picoides pubescens*	X		
Hairy Woodpecker	*Picoides villosus*			
American Kestrel	*Falco sparverius*			
Eastern Phoebe	*Sayornis phoebe*	X		
Great Crested Flycatcher	*Myiarchus crinitus*	X		
Western Kingbird	*Tyrannus verticalis*			
Eastern Kingbird	*Tyrannus tyrannus*			
Scissor-tailed Flycatcher	*Tyrannus forficatus*	X	•	•
Loggerhead Shrike	*Lanius ludovicianus*		•	•
Bell's Vireo	*Vireo bellii*	X	•	•
Red-eyed Vireo	*Vireo olivaceus*			
Blue Jay	*Cyanocitta cristata*	X		
American Crow	*Corvus brachyrhynchos*	X		
Horned Lark	*Eremophila alpestris*			
N. Rough-winged Swallow	*Stelgidopteryx serripennis*			
Cliff Swallow	*Petrochelidon pyrrhonota*	X		
Barn Swallow	*Hirundo rustica*			
Carolina Chickadee	*Poecile carolinensis*	X		
Tufted Titmouse	*Baeolophus bicolor*			
Rock Wren	*Salpinctes obsoletus*	X		
Carolina Wren	*Thryothorus ludovicianus*			
Bewick's Wren	*Thryomanes bewickii*	X		
Blue-gray Gnatcatcher	*Polioptila caerulea*	X		
Eastern Bluebird	*Sialia sialis*			
American Robin	*Turdus migratorius*			
Brown Thrasher	*Toxostoma rufum*	X		
Northern Mockingbird	*Mimus polyglottos*	X		
Common Yellowthroat	*Geothlypis trichas*	X		
Yellow-breasted Chat	*Icteria virens*			
Rufous-crowned Sparrow	*Aimophila ruficeps*	X		
Cassin's Sparrow	*Aimophila cassinii*	X	•	•
Field Sparrow	*Spizella pusilla*	X		

TABLE 1. Continued. Breeding birds of the Four Canyon Preserve (modified from Reinking and Patten 2007).

Common Name	Scientific Name	Observed in 2014[1]	Species of Conservation Concern[2]	TNC Target[3]
Lark Sparrow	*Chondestes grammacus*	X		•
Grasshopper Sparrow	*Ammodramus savannarum*	X		
Northern Cardinal	*Cardinalis cardinalis*	X		
Blue Grosbeak	*Passerina caerulea*	X		
Indigo Bunting	*Passerina cyanea*			
Painted Bunting	*Passerina ciris*	X	•	
Dickcissel	*Spiza americana*	X		
Red-winged Blackbird	*Agelaius phoeniceus*	X		
Eastern Meadowlark	*Sturnella magna*	X		
Western Meadowlark	*Sturnella neglecta*	X		
Common Grackle	*Quiscalus quiscula*			
Brown-headed Cowbird	*Molothrus ater*	X		
American Goldfinch	*Carduelis tristis*			

[1] Species denoted 'X' were recorded during this study.

[2] Inclusion in two or more of the following lists of at-risk species: Oklahoma Comprehensive Wildlife Conservation Strategy (ODWC 2005), Audubon 2007 WatchList for United States Birds (Butcher et al. 2007), Birds of Conservation Concern 2008 (USFWS 2008), Partners in Flight 2012 Species Assessment Database action priorities (PIF 2012).

[3] Nested conservation elements as described in Hise & Tejan (2005).

Cassin's Sparrow along the eastern edge of its range (Sutton 1967; Reinking 2004); therefore, it is unknown whether the observed population increase represents a response to habitat modifications (e.g. prescribed burning, managed grazing) conducted since 2007 or is merely a transient phenomenon. Information obtained from eBird.org suggests that a higher than typical number of Cassin's Sparrows were reported from Oklahoma in June 2014 (eBird 2014).

Western Meadowlark was detected at two point count stations and noted beyond the radius of a third. The presence of multiple singing individuals suggests the possibility of on-site breeding by this species, which was not recorded during previous assessments (Patten et al. 2006; Reinking and Patten 2007). Two of the birds I observed exhibited "bivalent" song patterns (Davis and Lanyon 2008) with secondary notes very similar to those of the Eastern Meadowlark (*S. magna*), highlighting the potential difficulties of positively identifying these two species in areas of sympatry.

Northern Bobwhite was detected in upland and floodplain habitats across the Preserve and was the second most abundant species encountered during my surveys. Though locally common in parts of Oklahoma (Reinking 2004), the decline of this species throughout its range has been well documented and is a subject of much interest to sportsmen (Dailey et al. 2011). The figures presented here indicate a modest population increase from 2005 and 2007, and offer encouragement for ongoing conservation efforts in the region.

Given the small number of survey sites included in this study and the low number of observations for most species, annual application of this protocol is unlikely to produce statistically valid trend data for most breeding birds on the Preserve (Nur et al. 1999). However, continued monitoring efforts may provide valuable data to help guide management decisions and broaden the knowledge of local ecology. Project managers may consider increasing the number of points for future survey efforts as resources permit. Alternative survey methods should be considered for raptors, grouse, and other taxa not adequately sampled by standard point counts (Ralph et al. 1995).

A complete record of bird observations recorded during this study is available from the author upon request.

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TABLE 2. Relative abundance, frequency of occurrence, and mean species richness for 2014 point counts at the Four Canyon Preserve. Year 2005 summer status codes from Patten et al. (2006) provided for reference.

	All habitats (n=18)		Upland (n=11)		Floodplain (n=4)		Canyon (n=3)		
Species	Relative abundance	Frequency	Relative abundance	Frequency	Relative abundance	Frequency	Relative abundance	Frequency	2005 status[1]
Eastern Meadowlark	0.528	0.500	0.636	0.636	0.625	0.500			C
Northern Bobwhite	0.444	0.556	0.455	0.545	0.750	1.000			F
Dickcissel	0.333	0.222	0.136	0.182	1.125	0.500			C
Grasshopper Sparrow	0.306	0.389	0.500	0.636					C
Painted Bunting	0.278	0.278	0.136	0.182			1.167	1.000	C
Lark Sparrow	0.250	0.389	0.273	0.455			0.500	0.667	C
Bewick's Wren	0.194	0.278	0.091	0.182			0.833	1.000	C
Brown-headed Cowbird	0.194	0.278	0.091	0.182	0.250	0.250	0.500	0.667	C
Cassin's Sparrow	0.194	0.278	0.318	0.455					R
Northern Cardinal	0.194	0.222	0.136	0.182	0.125	0.250	0.500	0.333	F
Scissor-tailed Flycatcher	0.139	0.167	0.045	0.091	0.500	0.500			F
Blue-gray Gnatcatcher	0.111	0.111					0.667	0.667	F
Red-winged Blackbird	0.111	0.056			0.500	0.250			U
Carolina Chickadee	0.083	0.111					0.500	0.667	C
Killdeer	0.083	0.111			0.375	0.500			R
Western Meadowlark	0.083	0.111			0.375	0.500			NR
Yellow-billed Cuckoo	0.083	0.111	0.045	0.091			0.333	0.333	U
Brown Thrasher	0.056	0.111			0.125	0.250	0.167	0.333	U
Cliff Swallow	0.056	0.056			0.250	0.250			U
Common Nighthawk	0.056	0.111	0.091	0.182					U
Common Yellowthroat	0.056	0.056			0.250	0.250			U
Field Sparrow	0.056	0.056			0.250	0.250			F
Great Crested Flycatcher	0.056	0.056					0.333	0.333	U
Mourning Dove	0.056	0.111	0.045	0.091			0.167	0.333	C
Red-bellied Woodpecker	0.056	0.111					0.333	0.667	F
American Crow	0.028	0.056					0.167	0.333	U
Blue Jay	0.028	0.056					0.167	0.333	U
Downy Woodpecker	0.028	0.056					0.167	0.333	U
Eastern Phoebe	0.028	0.056	0.045	0.091					U
Rufous-crowned Sparrow	0.028	0.056	0.045	0.091					U
Rock Wren	0.028	0.056					0.167	0.333	U
Turkey Vulture	0.028	0.056					0.167	0.333	F
Wild Turkey	0.028	0.056					0.167	0.333	F
Total relative abundance	4.278		3.091		5.500		7.000		
Mean species richness (SE)	5.3 (0.6)		4.3 (0.8)		5.3 (0.5)		9.0 (0.6)		

[1] C = common, F = fairly common, U = uncommon, R = rare, NR = not reported

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