Breeding Bird Populations at Selected Sites on Tewaukon National Wildlife Refuge Complex

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Introduction

The Tewaukon National Wildlife Refuge Complex (Complex) is managed by the U.S. Fish and Wildlife Service of the Department of the Interior. The Tewaukon National Wildlife Refuge Complex includes the Tewaukon National Wildlife Refuge (Refuge) and the Tewaukon Wetland Management District (District).

The Tewaukon Complex is located on the gently rolling glacial till plain of the Prairie Pothole Region and the Red River of the North Valley. The wetlands in this region are among the continent's most biologically productive systems. The majority of the Complex is located in the tallgrass prairie ecosystem, while a portion of western Ransom and Sargent counties lie in the mixed-grass ecosystem. The Complex is located on the eastern edge of the Central Migratory Bird Flyway and the western edge of the Mississippi Flyway. The Complex provides important habitat for a variety of wildlife, including waterfowl and other wetland and grassland birds.

The Refuge is located in southeastern Sargent County, North Dakota and is about 3,384 hectares (8,363 acres) in size. The Refuge was established in 1945 as "...a refuge and breeding ground for migratory birds and other wildlife..." Currently the Refuge has about 249 hectares (616 acres) of native prairie.

The Tewaukon Wetland Management District was established in 1960 with various lands in Ransom, Sargent, and Richland counties, North Dakota. The District is composed of Waterfowl Production Areas (WPAs) and wetland and grassland easements. There are over 5,665 hectacres (14,000 acres) of Waterfowl Production Areas in the three counties. These areas were acquired to provide habitat for migratory birds and for waterfowl production. About (3100 acres) of native prairie are scattered on various WPAs.

All lands and waters of the National Wildlife Refuge System are to be managed in accordance with an approved Comprehensive Conservation Plan (CCP). CCPs were mandated by the National Wildlife Refuge System Improvement Act of 1997. The U.S. Fish and Wildlife Service completed a CCP for the Tewaukon Complex in September 2000 (U.S. Fish and Wildlife Service 2000). The wildlife and habitat goals in the Tewaukon Complex CCP include restoring, enhancing, and preserving grassland habitat for grassland migratory birds on six prairie focus areas on the Refuge and three WPAs in the District. Several objectives were developed to meet this goal. These objectives included 1) controlling nonnative plant species; 2) increasing the diversity of native plant species; 3) providing for a variety of vegetative heights and densities; 4) achieving areas with no woody vegetation greater than one meter tall; and 5) monitoring relative abundance and breeding status of birds in the six Refuge areas and three WPAs identified for grassland bird management. Strategies to accomplish these objectives include prescribed burning, livestock grazing, control of nonnative plant species, seeding native grasses and forbs, haying, and removing of woody vegetation such as invasive Russian olive (*Eleagnus angustifolia*) trees and selected tree belts. To help determine whether management strategies are accomplishing the objectives, the Northern Prairie Wildlife Research Center (Center) staff developed a monitoring study on the Refuge and selected WPAs. The Center staff established study plots and conducted breeding-bird censuses and measured certain habitat features in the spring of 2001. Results from those surveys can be used as baseline information from which to monitor changes in bird populations and evaluate responses to management practices over time.

STUDY AREAS AND METHODS

Study areas

We established 11 study plots on the six Prairie Focus Areas. The 11 plots were divided into three different categories: 1) native prairie reference, 2) sites to be managed, and 3) potential Bird Conservation Area (BCA) sites. The native prairie reference sites were chosen by the Refuge staff because they represent the highest-quality native prairie sites on the Refuge. The three plots in this group were: 1) SW Sprague Lake (Native Prairie); 2) NE Mann Lake; and 3) Krause Slough.

The second category, sites to be managed, included five sites where specific management applications were planned: 1) North Pool 2--interseeding a variety of native grasses and forbs into a monotypic warm-season native-grass planting; 2) North Pool 2 Tree Removal site--interseeding a variety of native grasses and forbs into nonnative grass fields (brome and bluegrass) and removing a tree belt that bordered the site; 3) South Pool 4--nonnative grass field heavily infested with Canada thistle (*Cirsium arvense*), which will be treated chemically and re-seeded to native grasses and forbs; 4) SW Sprague Lake--nonnative grass field that will be re-seeded to native grasses and forbs; 5 SE Sprague Lake--a mixture of nonnative grasses and seeded warm-season native grasses will be interseeded with a variety of native grasses and forbs.

The third category, potential BCA sites, included plots that met certain criteria established in an evaluation of the Bird Conservation Area concept in the northern tallgrass prairie conducted by

Northern Prairie Wildlife Research Center (Winter et al. 1998, 1999, 2000). The criteria for BCA sites is small (<50 ha) patches of grassland in neutral landscapes (relatively little woodland). These three plots were established at nearby waterfowl production areas in the Tewaukon Wetland Management District: 1) Lunstad WPA, 2) Mahrer WPA, and 3) Palensky/Wyum WPA.

We sought to develop rectangular plots 16 ha in size in relatively homogeneous grassland. However, the area of homogeneous grassland in a rectangular shape was usually inadequate, so we had to settle for smaller and sometimes irregular-shaped plots (Table 1). All study plots included one or more wetlands.

We established plots by referring to aerial photographs of the areas, and using an orienteering compass and 50-meter tape measure. Surveyor's flags were placed at 50-m intervals throughout each plot to facilitate the accurate recording of bird locations. We recorded the locations of the four corners of each plot with a hand-held Rockwell plug-in Global Positioning System unit (Appendix 1).

Table 1: Size (ha) of study plots on which breeding birds were censused, and estimated area of wetland contained within plot

Plot	Total area	Wetland area
SW Sprague Lake (Native Prairie)	12.25	1.23
NE Mann Lake	13.5	1.73
Krause Slough	11.5	1.1
North Pool 2 (Interseed)	2.25	0.21
North Pool 2 (Tree Removal Site)	4.5	0.4
South Pool 4	6	0.19
SW Sprague Lake (Interseed)	6	0.3
SE Sprague Lake (Reseed)	8.25	0.65
Lunstad	5	1.9
Mahrer	11.3 (estimated)	6.2
Palensky	5	0.9

Bird surveys

Each study plot was surveyed on three separate occasions in mid or late June 2001. All birds were counted using a spot-mapping technique (Hall 1964, Van Velzen 1972): all territorial pairs or males (singing, calling, or visually observed) were recorded on a map of the plot. In addition, the date, time, and weather conditions were recorded for each survey. We recorded separately the birds observed in uplands from those observed in wetlands.

For most species, we interpreted a territorial male or a pair to represent one breeding pair. For Brown-headed Cowbirds, we used the number of females as our measure. For waterfowl, we used conventional methods (Hammond 1969, Higgins et al. 1992} to derive the breeding population. For each species and each plot, we used the maximum count from the three surveys as our estimate of the breeding population.

Vegetation measurements

Vegetation measurements were taken at the study plots between 6 and 10 July 2001. Vegetation subplots were taken at each study plot to obtain an adequate sample size. The number of subplots varied between six and 20, depending on the size of the study plot. Measurements were made using the Bird Conservation Area (BCA) protocols. We recorded: 1) percent cover (using a 20 x 50 cm Daubenmire frame) of grasses, forbs, woody plants, lying litter, standing litter, bare soil, and water; 2) number of short (≤ 30 cm) and tall (>30 cm) woody stems within the Daubenmire frame; 3) litter depth at each of the four corners of the Daubenmire frame; 4) vegetation height at each corner of the Daubenmire frame; 5) height and density of vegetation, using a Robel (Robel et al. 1970) pole, in each of the cardinal directions from the Daubenmire frame.

RESULTS

Breeding bird populations

We separated birds according to whether they were recorded in the upland portion of a plot or in a wetland. We further distinguished typical native grassland-dependent species (e.g., Bobolink) from others. Many of the "other" species are edge species that use several types of habitats (e.g., Song Sparrow) or are wetland-dependent species that may nest or forage in the uplands (e.g., Yellow-headed Blackbird). We also distinguished "transient" species, those that may forage over plots (e.g., swallows) but not nest in them.

The most common grassland species overall were Clay-colored Sparrow, Sedge Wren, Bobolink, and Savannah Sparrow (Tables 2a, 2b).

A variety of other (non-grassland) species were recorded in the plots. Most consistent among these were Red-winged Blackbird, Common Grackle, Song Sparrow, Eastern Kingbird, and Yellow Warbler (Tables 3a, 3b).

As is typical of these habitats with rich avian diversity, wetlands hosted a wide variety of species (Table 4a). Because many of the wetlands were small, the densities of observed species tended to be very high (Table 4b). Most common species in the wetlands were Red-winged Blackbird, Blue-winged Teal, Common Yellowthroat, and Mallard.

A variety of swallows, gulls, and other birds were observed foraging in the study plots (Table 5).

Although we did not systematically census birds in the tree belt in the North Pool 2 Tree Removal plot, we did note several species using that habitat (Appendix 2).

Incidental to censusing and other activities on the plots, were discovered 13 bird nests; these included seven Mallard, three Blue-winged Teal, one Gadwall, and two Clay-colored Sparrow (Appendix 3).

Habitat measurements

Average values of the vegetation measurements are listed in Table 6. Standard deviations of those values, measures of the habitat heterogeneity within a field, are given in Table 7.

Acknowledgments

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Table 2a: Breeding populations (number of pairs) of grassland bird species recorded in the uplands

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
Northern Harrier					1			1			
Upland Sandpiper		1						1			2
Sedge Wren		9	10	2		3	2	5			
Clay-colored Sparrow	18	17	14	3	5	8	2	2		1	3
Savannah Sparrow	1	1	2	3		2	3				4
Western Meadowlark										1	
Bobolink	1		3	1	2	2	2	5			2
Total	20	28	29	9	8	15	9	14	0	2	11

Table 2b: Densities of grassland bird species recorded in the uplands (per 100 ha of upland)

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
Northern Harrier					24.4			13.2			
Upland Sandpiper		8.5						13.2			48.8
Sedge Wren		76.7	96.2	98.0		51.6	35.1	65.8			
Clay-colored Sparrow	163.3	144.8	134.6	147.1	122.0	137.7	35.1	26.3		19.6	73.2
Savannah Sparrow	9.1	8.5	19.2	147.1		34.4	52.6				97.6
Western Meadowlark										19.6	
Bobolink	9.1		28.8	49.0	48.8	34.4	35.1	65.8			48.8

Table 3a: Breeding populations (number of pairs) of other bird species recorded in the uplands

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
American Bittern	1						1	1			
Canada Goose							1				
Mallard						1					
Ring-necked Pheasant		1			1			2			
Eastern Kingbird								2	1	2	1
American Robin										2	
Yellow Warbler	2	1			1					2	
Common Yellowthroat			5			1					
Song Sparrow	4	5	3	1					1		
Yellow-headed Blackbird				2							
Red-winged Blackbird	1		5	2		3	1	3	1		
Common Grackle	1	1	4					1	1	4	5
Orchard Oriole										1	
American Goldfinch		1				1				1	
Total	9	9	17	5	2	6	3	9	4	12	6

Table 3b: Densities of other bird species recorded in the uplands (per 100 ha of upland)

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
American Bittern	9.1						17.5	13.2			
Canada Goose							17.5				
Mallard						17.2					
Ring-necked Pheasant		8.5			24.4			26.3			
Eastern Kingbird								26.3	32.3	39.2	24.4
American Robin										39.2	
Yellow Warbler	18.2	8.5			24.4					39.2	
Common Yellowthroat			48.1			17.2					
Song Sparrow	36.3	42.5	28.9	49.0					32.3		
Yellow-headed Blackbird				98.0							
Red-winged Blackbird	9.1		48.1	98.0		51.6	17.5	39.5	32.3		
Common Grackle	9.1	8.5	38.5					13.2	32.3	78.4	122.0
Orchard Oriole										19.6	
American Goldfinch		8.5				17.2				19.6	

Table 4a: Breeding populations (number of pairs) of birds recorded in the wetlands

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
American White Pelican	1										
American Bittern											1
Great Blue Heron	1									1	
Wood Duck										1	
Mallard	4	1	6				2		1	5	3
Gadwall	2	1	1						2	3	1
Northern Pintail											1
Blue-winged Teal	4	1	6					3	1	8	4
Green-winged Teal											1
Redhead									1		
Ruddy Duck										2	
American Coot		1							4	1	3
Sora			1								
Killdeer		1	2					1		1	
Marsh Wren		1		1						2	
Common Yellowthroat	2	2	4	1	2	1	2	2	5	2	1
Song Sparrow			2		2	1			1	5	2
Swamp Sparrow	1										
Yellow-headed Blackbird										5	2
Red-winged Blackbird	11	7	6	3	3	2	2	4	5	6	5
Total	26	15	28	5	7	4	6	10	20	42	24

Table 4b: Densities of breeding birds recorded in the wetlands (per 100 ha of wetland)

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
American White Pelican	81.3										
American Bittern											111.1
Great Blue Heron	81.3									16.1	
Wood Duck										16.1	
Mallard	325.2	57.8	545.5				666.7		52.6	80.6	333.3
Gadwall	162.6	57.8	90.9						105.3	48.4	111.1
Northern Pintail											111.1
Blue-winged Teal	325.2	57.8	545.5					461.5	52.6	129.0	444.4
Green-winged Teal											111.1
Redhead									52.6		
Ruddy Duck										32.3	
American Coot		57.8							210.5	16.1	333.3
Sora			90.9								
Killdeer		57.8	181.8					153.8		16.1	
Marsh Wren		57.8		476.2						32.3	
Common Yellowthroat	162.6	115.6	363.6	476.2	500.0	526.3	666.7	307.7	263.2	32.3	111.1
Song Sparrow			181.8		500.0	526.3			52.6	80.6	222.2
Swamp Sparrow	81.3										
Yellow-headed Blackbird										80.6	222.2
Red-winged Blackbird	894.3	404.6	545.5	1428.6	750.0	1052.6	666.7	615.4	263.2	96.8	555.6

Table 5: Other (probably transient or foraging) birds observed

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
Black-Crowned Night-Heron										5	
Red-tailed Hawk		1									
Franklin's Gull	1										2
Ring-billed Gull											2
Black Tern	5							1			
Bank Swallow			1								
Tree Swallow							2			19	
Barn Swallow	2	1		1			1	4		2	
Total	8	2	1	1	0	0	3	5	0	26	4

Table 6: Means of vegetation measurements

	Reference sites			Sites to be managed					BCA sites		
Variable	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
Number of vegetation subplots	16	20	16	6	8	10	10	12	9	9	9
Grass cover (%)	21.3	18.3	39.7	56.7	30.6	29.5	18.0	39.6	26.7	18.3	25.0
Forb cover (%)	14.7	13.5	14.1	8.3	20.6	13.0	1.5	15.4	1.7	28.3	13.9
Woody cover (%)	13.4	19.8	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Standing litter cover (%)	3.4	3.5	3.1	1.7	3.8	4.0	5.0	4.2	1.7	6.1	3.3
Lying litter cover (%)	34.4	45.0	36.6	33.3	39.4	51.5	75.0	36.3	36.7	47.2	46.7
Bare soil cover (%)	0.3	0.0	0.3	0.0	5.6	2.0	0.0	4.6	0.0	0.0	0.0
Water cover (%)	12.5	0.0	6.3	0.0	0.0	0.0	0.0	0.0	33.3	0.0	11.1
Number of woody stems ≤30 cm tall	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of woody stems >30 cm tall	2.1	1.9	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Litter depth (cm)	4.4	5.2	3.3	4.7	1.2	3.5	5.7	1.3	4.6	2.3	5.3
Vegetation height (cm)	37.2	45.5	53.6	54.3	53.3	56.8	36.7	61.1	26.1	52.8	39.4
Robel pole (dm)	3.3	4.0	4.3	4.0	5.0	4.7	2.7	5.4	1.9	3.8	2.6

Table 7: Standard deviations of vegetation measurements

	Reference sites			Sites to be managed					BCA sites		
Variable	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
Grass cover (%)	26.6	17.3	26.9	16.3	24.3	23.9	8.9	23.7	21.0	21.8	23.5
Forb cover (%)	24.7	21.7	25.1	15.7	14.3	20.8	2.4	25.7	2.5	24.1	17.6
Woody cover (%)	20.6	25.9	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
Standing litter cover (%)	3.0	2.9	2.5	2.6	2.3	3.2	0.0	2.9	2.5	2.2	2.5
Lying litter cover (%)	29.7	26.3	25.2	21.1	23.8	23.9	7.5	24.5	28.3	22.4	26.9
Bare soil cover (%)	1.3	0.0	1.3	0.0	5.6	2.6	0.0	7.2	0.0	0.0	0.0
Water cover (%)	34.2	0.0	25.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	33.3
Number of woody stems ≤30 cm tall	1.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of woody stems >30 cm tall	3.2	2.8	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Litter depth (cm)	2.8	2.9	1.8	2.0	1.0	2.7	2.1	1.9	3.6	2.2	3.0
Vegetation height (cm)	20.5	25.4	28.7	9.6	36.3	14.0	4.8	20.0	20.3	30.2	18.3
Robel pole (dm)	2.4	2.6	2.3	0.9	5.8	1.0	0.6	1.9	1.5	2.2	1.3

Appendix 1: GPS coordinates of study plots

Study plot	Plot Coordinates	GPS Eastings	GPS Northings	Precision (m)
SW Sprague Native	0-0	612244	5096858	3.9
SW Sprague Native	0-100	612241	5096732	5.1
SW Sprague Native	0-200	612233	5096632	5.3
SW Sprague Native	50-300	612275	5096534	5.6
SW Sprague Native	50-350	612274	5096478	6.6
SW Sprague Native	350-350	612572	5096461	4.9
SW Sprague Native	350-0	612592	5096808	3.9
NE Mann	300-450	613987	5098972	5.5
NE Mann	300-0	614400	5098717	5.6
NE Mann	0-0	614185	5098495	4.9
NE Mann	0-450	613813	5098725	4.5
Krause Slough	IV-100	628520	5095921	3.9
Krause Slough	IV-400	628810	5095845	4
Krause Slough	I-400	628933	5096120	5.8
Krause Slough	I-0	628549	5096230	5.5
Krause Slough	III, IV-0	628467	5095991	5.3
N Pool 2 Interseed	0-0	625770	5096712	4
N Pool 2 Interseed	150-0	625594	5096699	4.2
N Pool 2 Interseed	150-150	625614	5096550	4.7
N Pool 2 Interseed	0-150	625765	5096563	4.2
N Pool 2 Tree Removal	150-0	624160	5096666	6.4
N Pool 2 Tree Removal	150-300	623854	5096678	6
N Pool 2 Tree Removal	0-300	623821	5096530	5.7
N Pool 2 Tree Removal	0-0	624122	5096520	6.3
S Pool 4	0-0	622518	5096199	4.7
S Pool 4	400-0	622123	5096243	4.7
S Pool 4	400-150	622139	5096392	4.7
S Pool 4	0-150	622535	5096346	4.9
SW Sprague Interseed	0-0	612100	5097165	5
SW Sprague Interseed	0-400	611704	5097204	3.9
SW Sprague Interseed	150-400	611675	5097058	3.7
SW Sprague Interseed	150-0	612069	5096996	3.8
SE Sprague Reseed	A-0	613863	5096721	3.6
SE Sprague Reseed	A-11	614423	5096718	3.5
SE Sprague Reseed	D-11	614414	5096567	3.6
SE Sprague Reseed	D-0	613855	5096570	4
Lunstad	0-250	607998	5106938	5.3
Lunstad	200-250	608198	5106930	5.8
Lunstad	200-0	608210	5106694	5.6
Lunstad	0-0	608004	5106692	5.6
Palensky	200-0	619845	5108785	4.4
Palensky	200-250	619855	5108523	4.6
Palensky	0-250	619650	5108517	4.8
Palensky	0-0	619646	5108810	5.6

Appendix 2: Birds observed in North Pool 2 tree belt

Mourning Dove
Willow Flycatcher
Eastern Kingbird
Cedar Waxwing
Yellow Warbler
Song Sparrow
Common Grackle
Orchard Oriole

Appendix 3: Bird nests found

	Reference sites			Sites to be managed					BCA sites		
Species	Sprague Native	NE Mann	Krause Slough	NP2 Interseed	NP2 Tree Removal	SP4	Sprague Interseed	Sprague Reseed	Lunstad	Mahrer	Palensky
Mallard	2	2				1	1				1
Gadwall		1									
Blue-winged Teal		1		1	1						
Clay-colored Sparrow	1	1									