Grassland Bird Conservation Efforts in Missouri and Iowa: How Will We Measure Success?[1]

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Abstract

Missouri and Iowa have adopted the Bird Conservation Area (BCA) model of Partners in Flight and applied the BCA model to ten areas managed to benefit grassland birds. These ten BCAs have large core areas of continuous grassland centered on active lek sites of Greater Prairie-Chickens (*Tympanuchus cupido*). Management is focused on expanding the number of hectares of grasslands, opening vistas by tree and shrub removal, and mowing lek sites. Using annual roadside surveys, we are evaluating grassland bird responses to conservation activities on the ten BCAs by monitoring bird abundance within each BCA and a paired control area. We also are sampling bird abundances in several habitat types: grazed native prairie, hayed native prairie, grazed cool-season grasses/forbs, hayed cool-seasons grasses/forbs, warm-season Conservation Reserve Program (CRP) fields, and cool-season CRP fields. The roadside counts allowed comparison of population trends between landscapes managed for grassland birds and landscapes not managed for grassland birds. The assessment of abundances per habitat types will allow us to determine which cover types support greater abundances of high priority grassland bird species and allow us to make appropriate recommendations to public and private landowners.

Key words: Tympanuchus cupido, Ammodramus henslowii, Ammodramus savannarum, Spiza americana, grassland birds, Bird Conservation Area.

Introduction

In the last 35 years, grassland bird populations have declined more consistently and ubiquitously than any other avian suite of species associated with a certain habitat or landscape (Vickery et al. 2000). Recent analysis of the Breeding Bird Survey (BBS) reveals negative range-wide population trends for many grassland bird species between 1990 and 2000, including Henslow's Sparrow (*Ammodramus henslowii*), Grasshopper Sparrow (*Ammodramus savannarum*), Dickcissel (*Spiza americana*), and Eastern Meadowlark (*Sturnella magna*). States in the tallgrass prairie region have lost almost their entire native grassland habitat. For example, at the time of settlement by Europeans, 6,072,874 hectares (15,000,000 acres) of tallgrass prairie covered about one third of Missouri (Missouri Department of Conservation (1999). Today, fewer than 36,437 hectares (90,000 acres) of tallgrass prairie remain. Only 8,907 hectares (22,000 acres) are in public ownership (Missouri Department of Conservation 1999). Coincident with the loss of native grasslands was the rapid population decline of Greater Prairie-Chickens (*Tympanuchus cupido*) through market hunting in the 1800s and early 1900s (Callison 1981). Land use conversion (from native grasslands to cropland or nonnative grasslands) or natural succession (from grasslands to shrub or woodland vegetative cover types) as well as habitat fragmentation and habitat degradation have negatively affected distributions, abundances, and reproductive success of grassland birds.

The Greater Prairie-Chicken and the Henslow's Sparrow are two of the species of greatest conservation concern in every Partners in Flight (PIF) physiographic area where they occur. In Missouri, the Greater Prairie-Chicken recently was listed as state endangered and could be extirpated in the state by 2010 without a significant conservation effort on its behalf. A summary of the BBS from 1966 to 2000 revealed that Henslow's Sparrow has been declining range-wide by 7.7 percent annually, although it has been increasing in Missouri by 5.5 percent annually (Sauer 2001).

PIF has suggested a landscape and habitat model to help focus management efforts for grassland birds. The PIF Bird Conservation Area (BCA) model (Fitzgerald and Pashley 2000) attempted to meet the needs of all grassland birds at all relevant spatial scales. The BCA model was based on the biology and habitat requirements of Greater

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Prairie-Chickens and other grassland birds (Fitzgerald and Pashley 2000), and evaluation studies of BCA model concepts (J. Herkert, unpubl. data). We are implementing the BCA model and will be evaluating and assessing the project until at least 2012.

In a coordinated effort between Missouri and Iowa, we have established BCAs in 10 study areas.

Project objectives overall are:

1. To increase habitat acreage for and population size of Greater Prairie-Chickens and other grassland bird species via land acquisition, easements, outreach, and incentive programs.

2. To implement the PIF grassland BCA model discussed in the Dissected Till Plains, Osage Plains, and other PIF physiographic area plans developed for tallgrass prairie regions of the midwestern United States (Fitzgerald and Pashley 2000).

3. To initially manage Pawnee Prairie/Dunn Ranch as the core of a healthy tallgrass prairie ecosystem, and to expand similar efforts to all 10 BCAs.

4. To create a partnership with landowners and foster an understanding of the importance of the need to conserve native grasslands and grassland birds.

5. To initiate a monitoring protocol to establish baseline and annual data collection, and monitor population change in relation to habitat quality and management.

Objectives of our paper are to:

1. Describe the organizational aspects of this project.

2. Present the short-term and long-term bird monitoring strategy.

3. Summarize briefly the first year's bird monitoring data collection effort.

Methods

Bird Conservation Area Model

The original PIF grassland BCA model called for an approximately 800-hectare (2,000-acre) core of quality grassland habitat within a 3200-hectare (8,000-acre) matrix, or a 1.5 km (1 mile) wide buffer zone. The matrix around the core area should contain an additional 800 hectares (2000 acres) of quality grassland habitat in blocks of 40 hectares (160 acres) or greater. Cropland in the matrix is considered "neutral," woody vegetation "hostile," with respect to their ability to facilitate the movement of predators of grassland birds. Core areas were centered upon Greater Prairie-Chicken leks and managed to provide adequate habitat structure for nesting, brood rearing, and roosting, which generally occur within a 1.5 km radius of a lek. Management to meet the needs of Greater Prairie-Chickens within core areas is hypothesized to be compatible with the needs of other high priority species such as Henslow's Sparrow, Dickcissel, and Grasshopper Sparrow. The matrix around the core areas should contain a minimum of tall woody vegetation, as well as the above mentioned 800 hectares (2,000 acres) of grassland so that the percentage of grassland in the matrix is 25 percent or greater and the percentage of grassland in the BCA as a whole is at least 40 percent.

Study Areas

In Missouri, the Grasslands Coalition formed in 1998. Nine Grasslands Coalition Focus Areas were designated. Bird Conservation Areas were superimposed over the Focus Areas based on active Greater Prairie-Chicken lek locations. Each Focus Area had a management team supported by many partners. The teams worked on public land and with willing landowners on private land to manage for BCA objectives. Federal and state agencies helped to target landowner incentives to areas that were within the focus areas. Management activities selected as appropriate for grassland birds in the focus areas were woody vegetation removal, fescue conversion to restored prairie with local ecotype seeds, prescribed burns on many thousands of acres of native prairie, and the establishment of low to moderate density rotational grazing.

As an example, the Dunn Ranch BCA in Harrison County, Missouri (Township 66N, Range 28W, Sections 29-33), encompassed four active Greater Prairie-Chicken leks, and the BCA design was modified to take this into account. The four overlapping core areas around the leks totaled 2,100 ha, with the matrix encompassing an additional 5,800 ha, for a total of 7,900 ha. Grassland (primarily pasture) and forest cover were approximately 80 percent and 6 percent, respectively, of the matrix of the Dunn Ranch BCA. This was well above 25 percent grass coverage targeted by the BCA model, and very near the recommended maximum of 5 percent forest coverage.

Conservation efforts in The Nature Conservancy's (TNC) Dunn Ranch Preserve area will involve mostly landowner incentive programs administered by the Natural Resources Conservation Service. Much of the land cover in the core zone was in grass, but had been heavily grazed and could benefit from a rest rotation. Some cropland will be converted to grassland. Prescribed fire, light grazing, and rotational grazing systems appear to be useful in producing the needed structure. Management costs and approaches vary dep-

ending on whether a given management unit is on public or on private lands within the BCA, as well as with the unpredictable responses of the vegetation to management. Without management, the newly acquired (1999) Dunn Ranch Preserve could quickly become unsuitable for Greater Prairie-Chickens and many other grassland species if rank weed growth occurs in the year after cattle were removed. Woody encroachment would likely follow within 5 to 10 years (K. Kinne TNC, R. Arndt Missouri Department of Conservation, pers. comm.).

Habitat on the Dunn Ranch will be managed by rotational grazing, haying, and prescribed fire. Habitat improvements on private lands in the core area will focus on the voluntary conversion of cropland to native grasses, reducing cattle stocking rates to mitigate the negative impacts of over-grazing, and removing tall woody vegetation in fence rows. Native prairie shrubs and vines will be left in small drainages and in fencerows when possible. Only invasive tree species will be targeted for removal. Cost-share has been offered to private landowners to encourage their cooperation.

Monitoring and Assessment Strategy

Assessing relative abundance by habitat type

We examined bird relative abundances in several habitat types—grazed native prairie, hayed native prairie, grazed cool-season grasses/forbs, hayed cool-season grasses/forbs, warm-season Conservation Reserve Program (CRP) fields, and cool-season CRP fields—to determine which support target species were in greatest abundance. Within each BCA, all habitats of the six designated treatment types were identified and mapped. Treatment types were mapped in the following four Missouri BCAs (*table 1*): Prairie State Park/Shawnee Trails, Taberville Prairie, Hi Lonesome, and Pawnee Prairie/Dunn Ranch (*table 1*).

Sixteen-hectare (40-acre) study plots were established in each available habitat type. Five BCAs were used during 2001: four in Missouri and one in Iowa. Within the four Missouri BCAs there were four clusters, each cluster with one replicate for each of the six habitat treatments. When more than one field of a single treatment type was available within a cluster, only one was selected randomly to survey. Occasionally, no treatment types were available within a cluster. The Iowa BCA did not have clusters.

Within each 16-ha plot, four points were located 100 m from each edge, or at the center of each quadrant of the plot. All birds were recorded over a 5-minute period. A notation was made for 0-3 minutes and 3-5 minutes. Bird observations were recorded either as 0 to 50 m or 50 to 100 m from the center point, or as flyovers.

Table 1— *The Grassland Coalition Focus Areas/Bird Conservation Areas*

Name	Acres	Hectares
Pawnee Prairie/Dunn Ranch	25,595	10,362
Green Ridge Township	15,502	6,276
Hi Lonesome	46,812	18,952
Taberville Prairie	13,433	5,438
El Dorado Prairies	10,449	4,230
Prairie State Park/ Shawnee Trails	20,199	8,178
Stoney Point/Horse Creek	24,423	9,888
Golden/Dorris Creek Prairie	20,250	8,198
Mystic	17,062	6,908
Kellerton, Iowa	7,040	2,850
Totals	**200,125**	**81,280**

After a point-count was conducted, vegetation was sampled at four randomly selected distances (between 5 and 95 m) and directions from the center point. A Robel pole was used to record and average four height-density readings at each of the four points (Robel 1970). Litter depth and bare soil were recorded along with each height-density reading, giving 16 litter-depth and bare-soil measurements per bird count point. Vegetation was monitored at all bird count points.

All point counts and vegetation monitoring were conducted twice during May and June. In Missouri, surveys started in the southernmost BCA and proceeded to the northernmost.

Data were analyzed by using PROC MIXED (Littell et al. 1996). The analysis accounted for the clustered plots and the four repeated samples within fields.

BCA and BCA pair monitoring

We evaluated grassland bird population responses to management in the ten BCAs by monitoring bird relative abundance within each BCA. Associated with each BCA was a paired control area of similar size and vegetative composition that was 8 to15 km away. The roadside counts allow comparison of population trends in managed and unmanaged landscapes. We used a modified BBS (Robbins 1986)-type roadside count to determine overall trends in BCAs managed for grassland ecosystems and grassland birds versus unmanaged paired areas. For each survey route, up to 50 stops were established along roads in all habitats in both the BCA and BCA Pairs. Three-minute counts were conducted at each stop, recording all individuals observed by sight or sound. A BCA and its pair were surveyed by the same observers when possible. Surveys were conducted between 25 May and 5 July. Surveys will be conducted annually for ten years. Surveys were con-

ducted in Kellerton, Iowa, using the same BBS methodology.

Results

Habitat Monitoring

Of the 70 fields available for survey in Missouri, 13 Native Prairie Grazed, 12 Native Prairie Hayed, 15 Cool Season Grazed, 13 Cool Season Hayed, 9 Warm Season CRP, and 8 Cool Season CRP fields were surveyed. Sixty-seven species of birds were recorded in the habitat fields in the four Missouri BCAs.

The primary results from an analysis of effects of site (BCAs) and habitat type were a significant interaction between these factors (*table 2*). Because of these interactions, examination of effects of habitat type would have to be done for each site. The variation in bird detections per point clearly was illustrated by Henslow's Sparrow (*fig. 1*), both within BCAs and among habitat treatments. The few detections of Northern Bobwhite in Hi Lonesome and especially Pawnee Prairie/Dunn Ranch BCAs (*fig. 2*) need further consideration. Brown-headed Cowbirds were present in most habitat types in all BCAs (*fig. 3*). Habitat data from Iowa were not analyzed in our paper; however, Iowa roadside counts are included in *figure 4,* indicating the total number of BCAs in which target bird species were detected.

Table 2— *Effects of the interaction between site and habitat type*

Species	df/df	F value	P > F
Bell's Vireo	13/168	7.52	<0.0001
Brown-headed Cowbird	13/167	1.93	0.0299
Bobolink	13/167	6.47	<0.0001
Dickcissel	13/168	2.82	0.0011
Eastern Meadowlark	13/168	2.36	0.0063
Field Sparrow	13/168	3.15	0.0003
Henslow's Sparrow	13/168	9.47	<0.0001
Northern Bobwhite	13/168	1.87	0.0366
Upland Sandpiper	13/168	4.14	<0.0001

BCA and BCA Pair Monitoring

On the 20 BBS-type roadside counts in the BCAs and BCA Pairs, 104 species of birds were recorded. The only target species to occur in all 20 areas were Dickcissel, Grasshopper Sparrow, and Eastern Meadowlark (*fig. 4*).

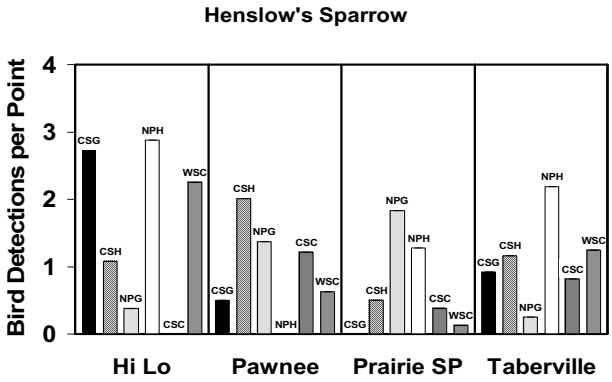

Figure 1— Henslow's Sparrow detections per point by habitat and BCA. Key to treatment labels: CSG = Cool Season Grazed, CSH = Cool Season Hayed, NPG = Native Prairie Grazed, NPH = Native Prairie Hayed, CSC = Cool Season Conservation Reservation Program (CRP), WSC = Warm Season CRP.

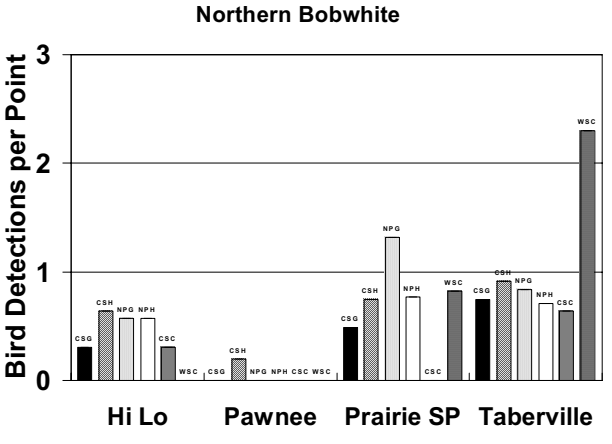

Figure 2— Northern Bobwhite per point by habitat and Bird Conservation Area. See *figure 1* for codes.

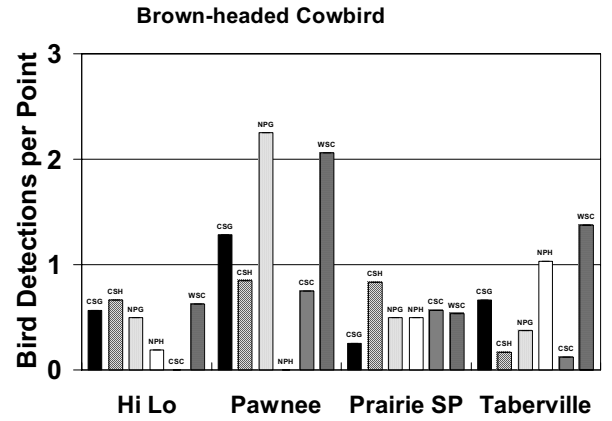

Figure 3— Brown-headed Cowbird per point by habitat and Bird Conservation Area. See *figure 1* for codes.

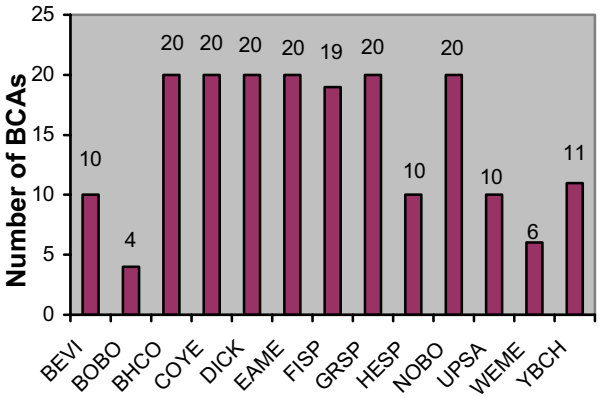

Figure 4— Number of Bird Conservation Areas in which target species were detected by roadside Breeding Bird Survey-type counts. BEVI = Bell's Vireo, BOBO = Bobolink, BHCO = Brown-headed Cowbird, COYE = Common Yellowthroat, DICK = Dickcissel, EAME = Eastern Meadowlark, FISP = Field Sparrow, GRSP = Grasshopper Sparrow, HESP = Henslow's Sparrow, NOBO = Northern Bobwhite, UPSA = Upland Sandpiper, WEME = Western Meadowlark, YBCH = Yellow-breasted Chat.

Discussion

In the first year of our study it appeared that we confirmed the highly variable nature of bird populations in grassland habitats (Winter et al. 2001) The variety of habitats used by most species and the variation of relative abundance between habitats in different BCA regions suggests a need to look at landscape level factors such as adjacent habitat types and overall land cover within each BCA in more detail.

An analysis of the Breeding Bird Survey for 1990 to 2000 indicated an annual decline of approximately 6.5 percent for Northern Bobwhite, explaining the low numbers all across Missouri. Few individuals were observed during point counts in the Dunn Ranch BCA; however, Northern Bobwhites were detected outside the 100 m point-count sampling radius on several occasions. Further study is needed to determine the effects of extensive removal of woody vegetation on this species.

The presence of Brown-headed Cowbirds in all habitat fields indicated that there likely was a high potential for brood parasitism in all habitats. It likely did not matter if the habitat was robust weedy vegetation or grazed pasture; cowbirds still would find nests to parasitize.

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