

EFFECTS OF PATCH-BURN GRAZING ON THE NESTING
SUCCESS OF GRASSLAND BIRDS
RESULTS OF PILOT YEAR 2016





Supplemental Report
to *Breeding Bird Surveys*
in *Missouri's Focal*
Grassland Landscapes,
January 2017 report to the
Missouri Department of
Conservation.

**In partial fulfillment of
cooperative agreement
#311, Amendment 2**



Suggested citation:

D. Ripper, E.C. Duke and K. Leonard. 2017. Effects of patch-burn grazing on the nesting success of grassland birds: results of pilot year 2016. Missouri River Bird Observatory report to the Missouri Department of Conservation. 2 pp.

Front Cover: Dickcissel nest
at Taberville Prairie, June
2017.

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SUMMARY. In 2016, the Missouri River Bird Observatory (MRBO) conducted a pilot season of nest-searching and monitoring to examine the effects of patch-burn grazing (PBG) on the nesting success of grassland birds. The goal of this study is to measure nesting productivity within four different management treatments (patch-burn grazed, burned ungrazed, unburned grazed, and unburned ungrazed). Observers located and monitored nests within PBG study sites at Taberville Prairie Conservation Area and kept continuous records of the status of nests from 25 May to 31 July. Dickcissel nests were the most numerous nests found, contributing significantly to the dataset; data for other species required pooling to obtain an acceptable sample size. Nest data were analyzed in R-Studio via a logistic exposure analysis to determine full-cycle nest survival rates. In 2016, the patch-burn grazed treatment had the highest percentage of full cycle nest survival, which agrees with numerous studies on patch-burn grazing and its successful use as a management tool. This study will continue in 2017 to bolster the nest dataset for grassland obligate species.

INTRODUCTION. PBG is a widely accepted management tool that is utilized to produce a diversity of vegetative structure, thus increasing both nesting and foraging habitat for a variety of grassland-obligate species (Churchwell et al. 2008, Coppedge et al. 2008, Hovick et al. 2011). To manage for grassland-obligate bird species in the <1% of native prairie remaining in Missouri, a comprehensive management toolbox includes the use of prescribed fire and moderate grazing. The effects of PBG on grassland bird nesting success in Missouri is an important topic for investigation.

The Missouri Department of Conservation's (MDC) Resource Science Division (RSD) has initiated a 15-year study examining the effects of patch-burn grazing on prairie ecosystems, with particular focus on plant communities. Study areas include Diamond Grove, Kickapoo, Providence, Wah'Kon-Tah, Taberville and Hi Lonesome Prairies. MRBO has initiated a parallel study to investigate the effects of PBG treatment on grassland bird nesting success and selected the Taberville Prairie PBG units (Fig. 1) as a study site for nest-searching and monitoring. During the pilot year of this project, the main objective was to assess the potential nest sample size present throughout the study area, the required sample size for investigating the effects of PBG treatment on nest survival, and the effectiveness of various nest-searching protocols. Target species included Eastern Meadowlark (*Sturnella magna*), Dickcissel (*Spiza americana*), Field Sparrow (*Spizella pusilla*), Henslow's Sparrow (*Ammodramus henslowii*), Grasshopper Sparrow (*Ammodramus savannarum*), and Bell's Vireo (*Vireo bellii*), though all nests found were recorded and monitored regardless of species.

STUDY AREA. Taberville Prairie Conservation Area (Fig. 1) is a 1,680-acre parcel located in the Upper Osage Grasslands complex and is characterized largely by native prairie (1,360 acres). Other components include warm season grass plantings, crop fields, prairie restoration, woodlots, and old fields. The study area falls on the eastern side of the property where nearly half of the area was grazed in 2016. Within the grazing treatment unit, 68.2 acres had been treated by prescribed fire, while 138.8 acres were unburned. Similarly, 62.4 acres of the ungrazed unit had received prescribed fire and 167 acres were untreated. The total nest-searching study area was 408.2 acres.

METHODS. MRBO observers conducted nest searches at Taberville Prairie Conservation Area from the end of May until mid-July. Equal time was spent nest-searching in the grazed and ungrazed units, with the number of searchers in each unit varying per day to ensure search times were equal. Searching began at sunrise and concluded by 12:00 pm to minimize disturbance to nesting birds during the hottest portion of the day. Each unit was traversed by foot and observers focused on cues such as flushing adults, short flights, chipping adults, or adults with food or nesting material. Upon flushing a bird, observers immediately searched the area for a maximum of ten minutes to minimize disturbance. If the nest was not found during that time period, observers knelt in a concealed location to watch for returning parents. If the nest was not found, the location of likely nesting areas was mapped using Collector for ArcGIS and observers returned later in the day or in following days to continue observation.

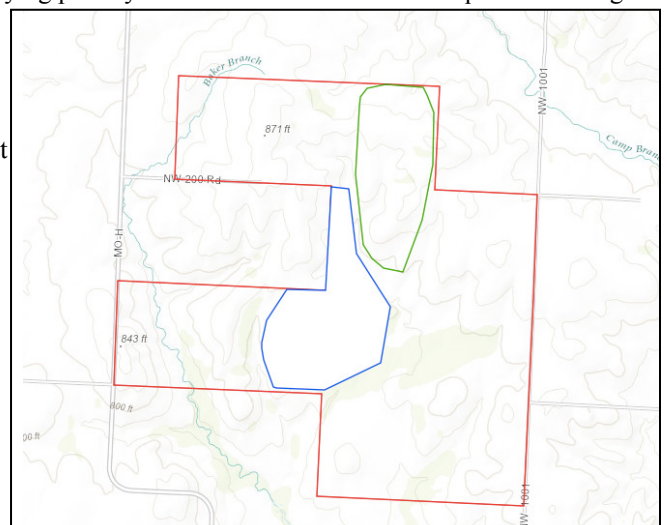


Figure 1. Taberville Prairie Conservation Area and the PBG study units: grazed (green) and ungrazed (blue).

Observations including date, species, method of discovery, nest stage, and observer name were recorded electronically. Nests were also marked visually by adhering a small piece of black electrical tape to tall vegetation in a triangular perimeter. Target species nests, with the exception of Eastern Meadowlark, were revisited every two days to check status. Non-target species nests and Eastern Meadowlark, a species susceptible to disruption, were revisited every three to five days. Nest observations tracked include: number of eggs and/or nestlings, presence of Brown-headed Cowbird eggs or nestlings, ultimate nest fate, and behavioral observations of interest (e.g. flushing off nest, chipping, food in mouth). Extreme precaution was taken to avoid trampling vegetation or using the same path to and from nests in order to reduce cues to potential nest predators.

Observers continued recording observational data on every visit until the nest was deemed either successful (at least one nestling fledged) or failed. A nest was deemed successful if the following were observed in conjunction with appropriate age of nestlings: a fledging event, an empty nest with vocal adults and/or fledglings present, or a nest cup empty other than fecal matter (fecal matter is removed continually from the nest by parents until the time of fledging). Nests were deemed failed if the nest was empty and/or disrupted before the appropriate fledging age or if the nest fledged only Brown-headed Cowbird young. Observers attempted to determine the cause of nest failure, classified as predation (mammalian or reptile) or other (e.g. weather damage, human disturbance or other cause) based on the state of the failed nest.

DATA ANALYSIS. R-Studio with packages library(lme4) and library(MASS) was employed to perform a Logistic Exposure analysis using PBG treatments units as covariates (Shaffer 2004). Required attribute data consisted of nest ID, date observed, date found, stage of nest (building, incubating, or nestling), status of the nest ('1' when the nest was active or fledged and '0' if the nest failed), the intervals between each day the nest was checked, and the nest's management sub-unit.

RESULTS. MRBO observers found 143 nests in the grazed (n = 77) and ungrazed (n = 56) treatment units (Table 1). An additional 51 nests were located that were deemed to be inactive (i.e., nesting had concluded before the nest-searching work had commenced); these nests were not considered for further analysis. Of the 143 active nests, 120 were nests of target species (Table 2).

Of the total active nest sample, 45 were successful in producing at least one fledgling, 66 failed due to predation (mainly snakes, which can be inferred by the lack of damage to nest cup), 21 failed for other reasons, three were abandoned before completion, four were still active at the end of the field season, and four fates were unknown. Target species nest success varied widely between study units (Table 2).

Logistic Exposure analysis provided the daily, weekly and full cycle nest survival rates (Table 3, Fig. 2). Dickcissel nest sample size was adequate for generating nest survival estimates in all management types. Sample sizes for all other species were inadequate to yield statistics for individual treatment types, but were combined for further analysis by target species guild and all species combined.

Table 1. Number of active nests of all species located in Taberville Prairie Conservation Area patch-burn graze study areas. BU: Burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed.

	BU	PBG	UBG	UBUG	Total
Bell's Vireo		2	6	4	12
Brown Thrasher		4	6		10
Common Yellowthroat		1		1	2
Dickcissel	28	22	22	10	82
Eastern Kingbird				1	1
Eastern Meadowlark			5		5
Eastern Towhee				1	1
Field Sparrow		4	9	5	18
Grey Catbird		1			1
Grasshopper Sparrow			1		1
Henslow's Sparrow				2	2
Mourning Dove		1	2	1	4
Orchard Oriole	1				1
Red-winged Blackbird		1		1	2
Unknown Spp.				1	1
Total	29	36	51	27	143



From left: Dickcissel nest with eggs; Eastern Meadowlark nestlings, Henslow's Sparrow nest with eggs.

Table 2. Nest fate for target species nests found within Taberville Prairie Conservation Area patch-burn graze study areas. BU: Burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed.

BU					UBUG				
Target Species	Failed: Other	Failed: Predation	Successful	Unknown Fate	Active	Failed: Other	Failed: Predation	Successful	Unknown Fate
Bell's Vireo							3	1	
Dickcissel	6	14	7	1	1		4	5	
Eastern Meadowlark									
Field Sparrow						1	3	1	
Grasshopper Sparrow									
Henslow's Sparrow							2		
Total	6	15	7	1	1	2	15	8	1

PBG						UBG			
Target Species	Active	Failed: Other	Failed: Predation	Successful	Unknown Fate	Failed: Other	Failed: Predation	Incomplete	Successful
Bell's Vireo			1	1		5			1
Dickcissel	2	2	5	11	2	1	14	2	5
Eastern Meadowlark						2	2		1
Field Sparrow			3	1		1	4	1	3
Grasshopper Sparrow									1
Henslow's Sparrow									
Total	3	3	13	15	2	10	23	3	15



Eastern Meadowlark nest.

Table 3. Logistic Exposure function for target species nests found within Taberville Prairie Conservation Area patch-burn graze study areas. Nest sample sizes were adequate to analyze nest survival for Dickcissel, the target species guild, and all species combined. BU: Burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed.

Treatment Unit	Species/Group	Nest Survival			SE
		Daily	Weekly	Full Cycle	
PBG	Dickcissel	97.0%	80.6%	52.4%	0.096
	Target Guild	96.0%	75.2%	42.5%	0.075
	All Species	95.5%	72.5%	38.2%	0.060
BU	Dickcissel	92.5%	57.8%	19.4%	0.038
	Target Guild	92.5%	57.8%	19.4%	0.038
	All Species	92.3%	57.0%	18.6%	0.036
UBG	Dickcissel	89.5%	45.9%	9.7%	0.025
	Target Guild	91.0%	51.7%	13.8%	0.023
	All Species	92.5%	58.1%	19.7%	0.030
UBUG	Dickcissel	97.1%	81.1%	53.4%	0.126
	Target Guild	94.1%	65.5%	28.1%	0.056
	All Species	93.8%	63.9%	26.0%	0.048

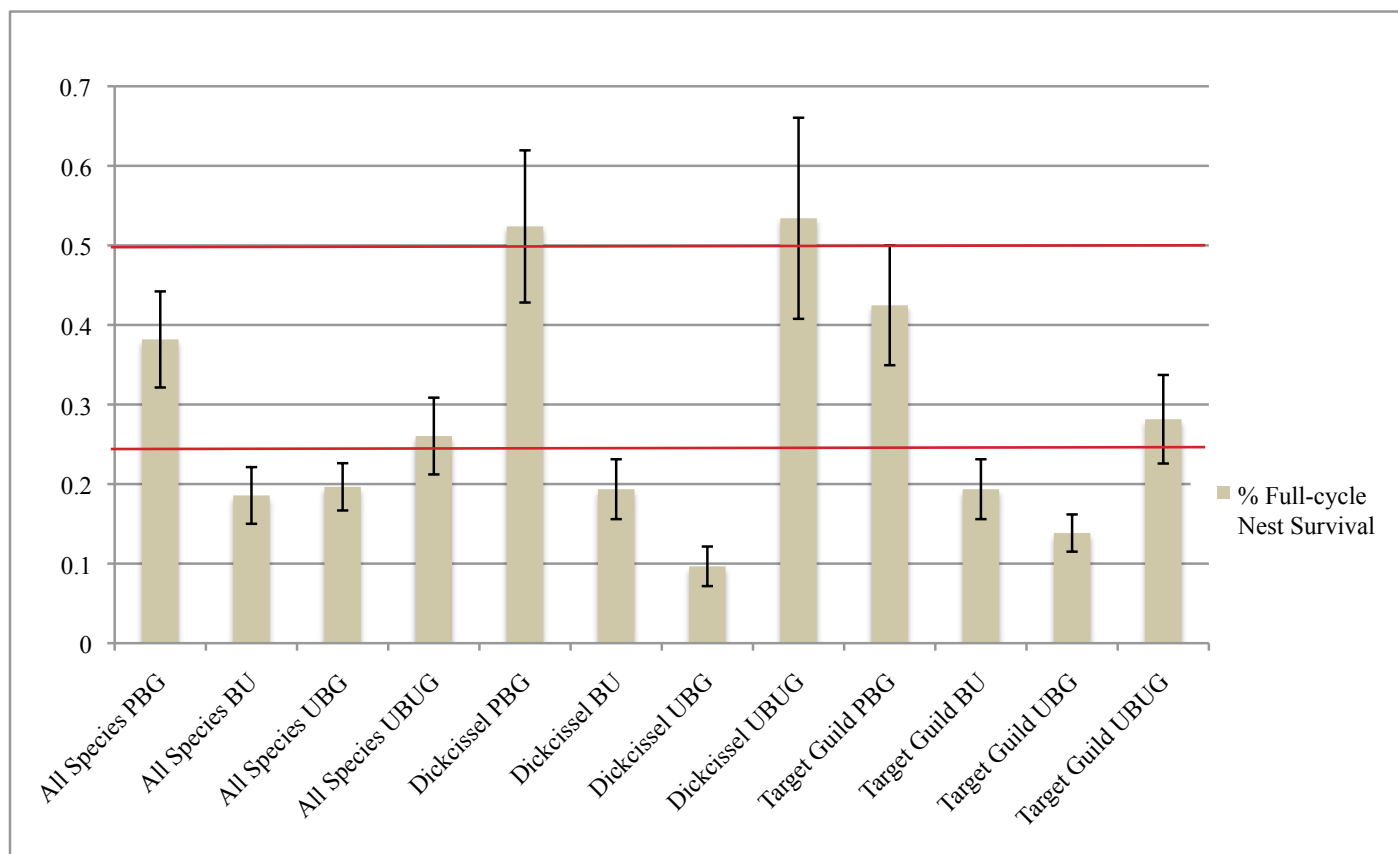


Figure 4. Relative survival of nests within Taberville Prairie Conservation Area patch-burn graze study areas. Nest sample sizes were adequate to analyze nest survival for Dickcissel, the target species guild, and all species combined. BU: Patch-burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed. Standard error represented by error bars. Red lines indicate average nest success of prairie birds suggested by Winters (1999) in southwest Missouri.

DISCUSSION. The limited data resulting from the pilot year nest-monitoring study indicates that differences may occur in target species nesting success across study units. Initial data suggest that Dickcissels experience the highest nest survival rate in PBG and UBUG units. This trend was also observed in the target species guild and all species taken as a whole. These latter results must be interpreted with caution, however, as the large sample size of Dickcissel nests had a disproportionate contribution to the target guild and all species analyses. Nest sample sizes of other target species were inadequate to undergo Logistic Exposure analyses, and current raw data do not suggest any particular trend in nesting success linked to grazing management.

Nest-searching and monitoring methodology improved over the course of this pilot year, which will inform and improve 2017 efforts. Improvements in nest-searching methodology will include the use of camouflaged blinds to facilitate Henslow's Sparrow nest-finding. The nests of this species are notoriously difficult to find, as evidenced by our low sample size in 2016, requiring additional effort and changes in methodology. The nests of other species were located in approximate proportion to their abundance on the study area, as compared to results from two rounds of all-species line-transect surveys performed on the PBG study units during the breeding season (Ripper et al. 2017). We anticipate that a second season of nest-searching and monitoring will afford a combined two-year sample size adequate for more detailed analysis.

ACKNOWLEDGEMENTS. We would like to Aaron Young of the University of Nebraska-Omaha for providing guidance on nest monitoring, data analysis, and R coding.

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