

EFFECTS OF PATCH-BURN GRAZING ON THE  
NESTING SUCCESS OF GRASSLAND BIRDS  
2016-2017

*A report to the Missouri Department of Conservation in partial fulfillment  
of Cooperative Agreement #311, Amendment 3*



**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 second year of this project took place in 2017, and it is slated to continue in 2018. The goal of the study is to measure nest survival within four different management treatments (patch-burn grazed [PBG], burned ungrazed [BU], unburned grazed [UBG], and unburned ungrazed [UBUG]). In 2016, 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. In 2017, nest-searching and monitoring was conducted at Wah’Kon-Tah Prairie from 14 May to 30 July.

Nest data were analyzed in R-Studio via a logistic exposure analysis to determine full-cycle nest survival rates. Sample size to date has allowed analyses on Dickcissel in 2016 and the target species guild and all species combined in 2016 and 2017. In 2016 at Taberville, the PBG 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. In 2017 at Wah’Kon-Tah, the highest nest survival rate was documented on the UBUG area, followed by the BU treatment. Future nest-monitoring on the PBG study areas should allow further elucidation on these trends.

**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 long-term 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 and vegetative structure. 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. The Taberville Prairie PBG unit was the first site selected for our examination of nest productivity. Due to a grazing rest period at Taberville in 2017, the study focused effort this year on Wah’Kon-Tah prairie where grazing was still active. 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 are recorded and monitored regardless of species.

**2017 STUDY AREA.** Wah’Kon-Tah Prairie (Fig. 1) is a 3,030-acre parcel located in the Upper Osage Grasslands Priority Geography and is characterized largely by native prairie (2,700 acres). Other components include warm season grass plantings and wooded areas. The 292-acre PBG study area falls on the northeastern side of Wah’Kon-Tah. The grazing treatment unit is 153.9 acres, of which 37 acres were burned on March 15<sup>th</sup>, 2017. The control (ungrazed) unit is 138.4 acres, of which 54 acres received prescribed fire on March 15<sup>th</sup>, 2017.

**METHODS.** Nest searching and monitoring methodology did not differ between years. MRBO observers conducted nest searches at Taberville Prairie Conservation Area from the end of May until mid-July, 2016 and at Wah’Kon-Tah from mid-May until the end of July. Four observers were employed on the project in 2016 and two in 2017. Observers spent equal time 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.

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

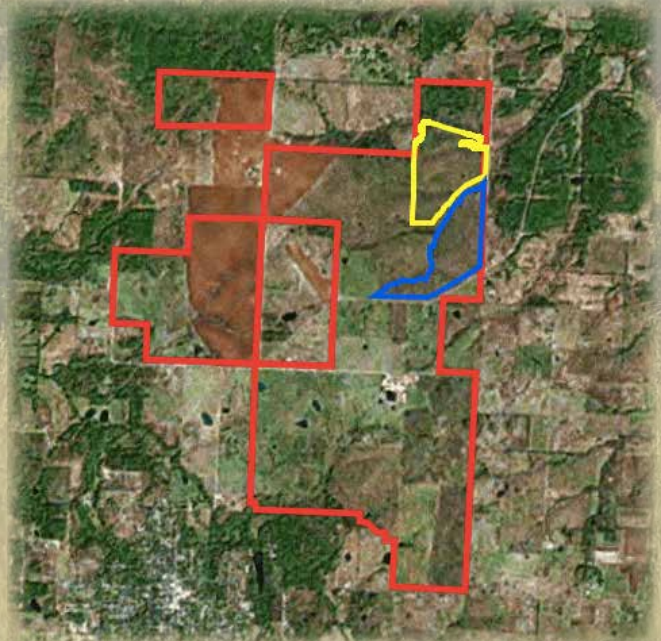


Figure 1. Wah’Kon-Tah Prairie and the PBG study units: grazed (yellow) and ungrazed (blue).



# NESTS LOCATED BY PBG UNIT, 2016-2017

## Taberville 2016

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

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



*Dickcissel*



*Bell's Vireo with Brown-headed Cowbird eggs.*

## Wah'Kon-Tah 2017

Table 2. Number of active nests of all species located on Wah'Kon-Tah Prairie patch-burn graze study areas in 2017. BU: Burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed. Target species denoted by **bold** type.

Species	BU	PBG	UBG	UBUG	Total
American Goldfinch	1		2	2	5
<b>Ammodramus spp.</b>			1		1
<b>Bell's Vireo</b>	1	1	8	8	18
Blue Grosbeak	1		2	1	4
Brown Thrasher	1	4		2	7
Common Grackle	1				1
<b>Dickcissel</b>	16		2	5	23
Eastern Kingbird	1		1		2
Eastern Towhee				1	1
<b>Field Sparrow</b>	2	6	2	3	13
Gray Catbird	13		5	3	21
Grasshopper Sparrow			2		2
<b>Henslow's Sparrow</b>			5		5
Indigo Bunting			1		1
Mourning Dove		1			1
Northern Cardinal	1				1
Northern Mockingbird	1				1
Orchard Oriole	1		1		2
Red-winged Blackbird	9		1		10
Yellow-breasted Chat	1			2	3
<b>Total</b>	50	12	33	27	122

# TARGET SPECIES NEST FATE BY PBG UNIT, 2016-2017

## Taberville 2016

Table 3. 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				
<i>Target Species</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>	<i>Active</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>
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		
<b>Total</b>	<b>6</b>	<b>14</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>12</b>	<b>7</b>	

PBG						UBG			
<i>Target Species</i>	<i>Active</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Incomplete</i>	<i>Successful</i>
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									
<b>Total</b>	<b>2</b>	<b>2</b>	<b>9</b>	<b>13</b>	<b>2</b>	<b>9</b>	<b>20</b>	<b>3</b>	<b>11</b>

## Wah'Kon-Tah 2017

Table 4. Nest fate for target species nests found within Wah'Kon-Tah Prairie patch-burn graze study areas. BU: Burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed.

BU					UBUG			
<i>Target Species</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>
Ammodramus Spp.		1						
Bell's Vireo	1				3	2	3	
Dickcissel	7	4	5			1	1	
Field Sparrow		1	1		1	1		1
Grasshopper Sparrow								
Henslow's Sparrow					3	1		1
<b>Total</b>	<b>8</b>	<b>6</b>	<b>6</b>		<b>7</b>	<b>5</b>	<b>4</b>	<b>2</b>

PBG					UBG			
<i>Target Species</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>	<i>Failed: Other</i>	<i>Failed: Predation</i>	<i>Successful</i>	<i>Unknown Fate</i>
Bell's Vireo			1		4		1	1
Dickcissel					2		2	
Field Sparrow	5	1				2		
Grasshopper Sparrow						1	1	
Henslow's Sparrow								
<b>Total</b>	<b>5</b>	<b>1</b>	<b>1</b>		<b>6</b>	<b>3</b>	<b>4</b>	<b>1</b>

# NEST SURVIVAL BY PBG UNIT, 2016-2017

Tables 5-7. Logistic Exposure function for target species nests found within Taberville and Wah’Kon-tah Prairies patch-burn graze study areas. Nest sample sizes were adequate ( $n > 50$ ) to analyze nest survival for the target species guild and all species combined in both years, and for Dickcissel in 2016.

BU: Burned, ungrazed; PBG: patch-burned, grazed; UBG: unburned, grazed; UBUG: unburned, ungrazed.

## Taberville 2016

Treatment Unit	Species/Group	Nest Survival			
		Daily	Weekly	Full Cycle	SE
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

## Wah’Kon-Tah 2017

Treatment Unit	Species Group	Nest Survival			
		Daily	Weekly	Full Cycle	SE
PBG	Target Guild	86.8%	37.2%	5.1%	0.021
	All Species	86.8%	52.7%	14.7%	0.046
BU	Target Guild	93.4%	62.0%	23.8%	0.050
	All Species	93.4%	62.0%	23.9%	0.033
UBG	Target Guild	90.4%	49.5%	12.1%	0.031
	All Species	91.6%	53.9%	15.7%	0.031
UBUG	Target Guild	94.9%	69.4%	33.4%	0.081
	All Species	94.9%	69.4%	33.4%	0.081

## Combined Results 2016-2017

Treatment Unit	Species Group	Nest Survival			
		Daily	Weekly	Full Cycle	SE
PBG	Target Guild	94.7%	68.3%	31.9%	0.054
	All Species	94.6%	68.1%	31.5%	0.045
BU	Target Guild	92.9%	59.7%	21.3%	0.030
	All Species	93.0%	60.3%	21.9%	0.024
UBG	Target Guild	90.8%	51.1%	13.3%	0.019
	All Species	92.2%	56.6%	18.1%	0.022
UBUG	Target Guild	94.4%	67.0%	30.1%	0.046
	All Species	94.2%	65.8%	28.5%	0.042

# NEST SURVIVAL BY PBG UNIT, 2016-2017

Figures 2 and 3. Relative survival of nests within Taberville and Wah'Kon-Tah Prairies patch-burn graze study areas. Nest sample sizes were adequate ( $n > 50$ ) to analyze nest survival for the target species guild and all species combined in both years, and for Dickcissel in 2016. 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.

