

BREEDING BIRD SURVEYS IN MISSOURI'S FOCAL GRASSLAND LANDSCAPES 2013 - 2018

REPORT TO THE MISSOURI DEPARTMENT OF CONSERVATION
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GRASSLAND BIRD SURVEYS 2013-2018

EXECUTIVE SUMMARY

The Missouri River Bird Observatory (MRBO) has conducted annual breeding bird surveys on public and private grasslands in Missouri since 2013. Surveys employ a line-transect Distance sampling methodology and are aimed at elucidating target species' population trends on Missouri's most important grasslands. MRBO also works directly with MDC Area Managers and private landowners to determine how plant communities, habitat structure, and yearly management activities influence grassland bird populations.

Over the past five years, MRBO has conducted surveys on a total of 94 grassland properties that include Conservation Areas, State Parks, Missouri Prairie Foundation holdings and private lands involved in MDC, Audubon, and Partners for Fish and Wildlife programs. Detailed descriptions of field methodology can be found in MRBO's reports to the MDC from 2014 to 2016. Most MDC properties within grassland Priority Geographies and Conservation Opportunity areas are currently on a one-year-on/on-year-off survey schedule. Exceptions include Conservation Areas that are part of the MDC's on going patch-burn grazing and Northern Bobwhite research. The data set resulting from these five years of surveys consists of 95,629 individual bird detections, including 58,777 detections of target species. Target species represent the guild of grassland obligate birds for which conservation concern is high.

The 2013-2018 data set allows us to observe trends in grassland bird populations throughout Missouri's focal areas. These landscape-scale areas include the Upper Osage Grasslands and Grand River Grasslands Comprehensive Conservation Strategy Priority Geographies as well as the Golden Prairie, Diamond Prairie, Cole Camp and Green Ridge Conservation Opportunity Areas (COA). This report shows changes in density for 11 grassland-obligate species on properties within those regions. The data also show some overall trends in grassland bird populations throughout the state. While these observed trends do not apply to every surveyed property, the trends are representative of the grassland focal areas as a whole.

- Our data suggest that grassland birds as a guild have experienced net increases in density in Missouri since 2013. This trend does not hold true in all regions; the Grand River Grasslands and the Cole Camp/Green Ridge area have displayed a decrease in grassland bird populations.
- The Dickcissel population exhibited the same trends as the guild. Indeed, their large numbers relative to other species likely contributed to the guild trends observed from 2013-2018. Dickcissel density has shown an overall increase over the course of the study period.
- Overall, Bell's Vireo, Eastern Meadowlark, Henslow's Sparrow, Field Sparrow and Northern Bobwhite densities have been maintained or have increased when observations from all sampled geographies are lumped.
- The Grasshopper Sparrow population has decreased significantly each year since 2013 and has bottomed out at a density of .05.
- Henslow's Sparrow populations have continued to decline over the past three years..
- Greater Prairie-Chicken, Loggerhead Shrike and Common Nighthawk continue to be extremely uncommon during grassland surveys. Detections of these species were slightly lower in 2018 than in 2017.

This report also provides a summary of the continued examination of grassland bird habitat use during fall migration.

Since 2013, we have amassed spatial data representing exact locations of each individual bird detected. This allows us to map bird occurrence in conjunction with management information in ArcGIS Online (AGOL) to develop a better understanding of how management actions directly affect bird habitat use. The resulting maps enable area managers and landowners to plan habitat management according to the bird populations they are trying to maintain or increase. The AGOL mapping platform and MRBO grassland bird data are available to all MDC staff. Data from public lands, excluding private lands data is available to the public. An overview of how to access and utilize the extensive survey and management data is provided on page 23 of this report. MRBO staff continue to meet with area managers on a yearly basis to present survey results and provide instructions for accessing on-line spatial data.

READING TABLES IN THIS REPORT

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha <0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly(alpha <0.05) lower density than previous survey year

All charts use this color code system (left) to indicate change in density over a given time period.

GRASSLAND OBLIGATE GUILD

Changes in density of the grassland obligate bird guild across years in Missouri's focal grassland landscapes. n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n >10 for a property. CV = coefficient of variance. If n, D or CV values are not presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

Property	2013 762 transects			2014 615 transects			2015 471 transects			2016 543 transects			2017 400 transects			2018 589 transects			Change in Density, first to last survey year
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													19	0.444	0.25	7	0		
Bruns Tract	38	1.562	0.05	38	1.701	0.26	123	3.767	0.09				64	1.503	0.1	70	1.611	0.07	0.049
Brush Creek Ranch																230	0.629	0.13	
Buffalo Wallow Prairie CA	92	0.441	0.18	222	1.325	0.13				391	1.527	0.16				332	1.123	0.16	1.086
Bushwacker Lake CA	350	0.574	0.08	348	0.636	0.09				634	0.973	0.08				804	1.046	0.07	0.472
Clear Creek CA	80	0.583	0.170	174	1.146	0.11				238	1.446	0.16				211	1.13	0.08	0.547
Comstock Prairie CA	25	0.334	0.29							70	0.779	0.25				103	1.012	0.18	0.678
Coyne-Penn-Welsch	69	0.616	0.25				172	1.348	0.16				260	1.563	0.13	252	1.49	0.09	0.874
Denison Prairie	39	0.627	0.17													143	1.69	0.08	1.063
Diamond Grove Prairie CA	49	0.437	0.23	175	1.424	0.11	450	1.661	0.08	345	1.086	0.06	353	1.278	0.1	219	1.075	0.13	0.638
Diamond Grove Prairie CA-PBG	43	0.864	0.23	109	2.439	0.12	149	1.283	0.14	156	1.146	0.15	220	1.453	0.1	184	1.19	0.11	0.326
Drovers Prairie CA	23	1.318	0.03	38	2.427	0.02	22	1.229	0.26							38	1.599	0.2	0.281
Drywood CA	1	0	0							4	0	0				3	0	0	
Frank	709	1.324	0.08	667	1.572	0.08				664	1.143	0.1				674	1.018	0.07	0.327
Friendly Prairie CA	9	0	0				14	1.012	0.02							17	0.859	0.08	
Grandfather Prairie CA	8	0	0				40	1.35	0.03							16	0.943	0.08	
Helton (The Wayne) Mem WA				79	0.589	0.25	82	0.535	0.14	125	0.709	0.2				140	0.818	0.2	0.229
Hi Lonesome Prairie CA	352	2.828	0.39	202	1.809	0.12	291	1.108	0.09	401	1.442	0.1	180	1.017	0.14	359	0.69	0.14	-2.138
Hodges																34	0.473	0.2	
Horse Creek Prairie CA	9	0	0				53	1.487	0.23							96	2.026	0.05	0.539
Indigo Prairie CA	6	0	0							10	0.919	0.02				26	1.166	0.08	0.247
Kearn (W.R.) Memorial CA	31	0.83	0.09	90	2.015	0.09	66	1.293	0.14				79	1.187	0.08	73	1.075	0.2	0.245
Kickapoo Prairie CA	7	0	0	48	2.149	0.34	72	0.94	0.32	116	1.292	0.19	136	1.363	0.32	116	1.139	0.12	

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Lattner Prairie	14	0.562	0.57													27	1.591	0.08	1.029
Little Osage CA	9	0	0							17	1.136	0.02				24	1.414	0.08	0.278
Mo-No-I Prairie CA	49	0.984	0.19							104	1.367	0.24				130	1.505	0.15	0.138
Monegaw Prairie CA							119	2.055	0.07	82	1.208	0.13				107	1.39	0.18	-0.665
Mora CA	118	1.053	0.09	147	1.462	0.13	253	1.019	0.11				101	0.605	0.17	117	0.741	0.17	-0.312
Morton	105	0.703	0.12	182	1.358	0.18				122	0.741	0.18				242	1.58	0.07	0.828
Niawathe Prairie CA	72	0.964	0.11	121	1.806	0.11	128	1.671	0.08							196	1.925	0.12	0.961
Osage Prairie CA	251	0.753	0.08	236	0.782	0.07				465	1.195	0.1				596	1.293	0.07	0.54
Pawnee Prairie	137	1.223	0.13	140	1.393	0.06	170	1.479	0.1	127	0.93	0.18				134	0.877	0.16	-0.346
Pawnee Prairie NA	75	0.669	0.25	173	1.721	0.15	134	1.167	0.12	160	1.047	0.15				121	0.788	0.16	0.119
Peterson	81	0.591	0.22	143	0.985	0.015				167	0.867	0.22				203	0.923	0.14	0.332
Pleasant Run Creek																42	1.237	0.24	
Prairie Fork CA	83	0.667	0.21							57	0.357	0.17				75	0.45	0.12	-0.217
Providence Prairie CA				34	0.762	0.31													
Redwing Prairie CA	19	0.763	0.05							91	3.041	0.08				55	1.62	0.13	0.857
Schwartz Prairie	29	0.582	0.23													99	1.458	0.12	0.876
Shawnee Trail CA	341	0.83	0.07	674	1.231	0.06				1079	1.306	0.09				1178	1.28	0.05	0.45
Shelton (Wade & June) Memorial CA	98	1.312	0.13	213	3.178	0.12	123	1.627	0.11	226	2.549	0.12				134	1.33	0.17	0.018
Stony Point CA				231	1.034	0.11	319	1.282	0.1	247	1.065	0.07	435	1.454	0.07	394	1.272	0.08	0.238
Taberville Prairie CA	239	0.914	0.08	516	2.199	0.1	669	1.248	0.08	752	1.794	0.13	838	1.938	0.09	636	1.425	0.08	0.511
Talbot (Robert E) CA	210	0.296	0.13				288	0.438	0.1	322	0.409	0.11	610	0.724	0.09	638	0.722	0.07	0.426
Van Meter SP (Utz)													50	0.904	0.08	32	0.567	0.13	-0.337
Wah'Kon-Tah Prairie (MDC/TNC)	432	0.723	0.06	936	1.643	0.06	1396	1.032	0.06	887	0.989	0.08	1482	1.461	0.05	1032	1.123	0.06	0.4

BELL'S VIREO



Bell's Vireo (BEVI)

Changes in Bell's Vireo density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													1	0	0	0	0	0	
Bruns Tract	0	0	0	1	0	0	2	0	0				3	0	0	5	0	0	
Brush Creek Ranch																3	0	0	

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Buffalo Wallow	17	0.121	0.31	15	0.1	0.45				34	0.159	0.24				53	0.218	0.19	0.097
Bushwhacker	56	0.136	0.15	42	0.086	0.16				156	0.286	0.17				108	0.171	0.15	0.035
Clear Creek	5	0	0	36	0.329	0.24				38	0.276	0.24				36	0.234	0.27	-0.095
Comstock	0	0	0							12	0.159	0.23				14	0.167	0.14	0.008
Coyne/Penn/Welch	0	0	0				1	0	0				0	0	0	10	0	0	
Dennison Prairie	0	0	0													4	0	0	
Diamond Grove (main unit)**	2	0	0	7	0	0	8	0	0	9	0	0	6	0	0	6	0	0	
Diamond Grove (grazed unit)	0	0	0	3	0	0	3	0	0	3	0	0	5	0	0	9	0	0	
Drovers	0	0	0	0	0	0	0	0	0							2	0	0	
Drywood	0	0	0							0	0	0				0	0	0	
Frank*	1	0	0	4	0	0				3	0	0				3	0	0	
Friendly	0	0	0				0	0	0							0	0	0	
Grandfather**	1	0	0				6	0	0							4	0	0	
Helton				2	0	0	2	0	0	8	0	0				12	0.085	0.32	
Hi-Lonesome	35	0.417	0.42	17	0.171	0.28	26	0.108	0.15	34	0.146	0.14	21	0.139	0.22	29	0.068	0.19	-0.349
Hodges																6	0	0	
Horse Creek	0	0	0				3	0	0							2	0	0	
Indigo***	0	0	0							3	0	0				6	0	0	
Kearn (WR)**	1	0	0	0	0	0	3	0	0				2	0	0	8	0	0	
Kickapoo**	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	4	0	0	
Lattner Prairie	0	0	0													6	0	0	
Little Osage	0	0	0							1	0	0				4	0	0	
Mo-No-I	2	0	0							4	0	0				7	0	0	
Monegaw							5	0	0	9	0	0				13	0.205	0.43	
Mora***	15	0.198	0.21	11	0.123	0.27	32	0.138	0.19				17	0.119	0.24	19	0.146	0.26	-0.052
Morton (Tillman)	9	0	0	14	0.117	0.28				13	0.094	0.3				30	0.238	0.2	0.165
Niawathe	1	0	0	8	0	0	11	0.153	0.33							18	0.215	0.15	0.062
Osage	18	0.079	0.25	16	0.06	0.28				56	0.172	0.18				70	0.184	0.19	0.105
Pawnee Prairie CA	2	0	0	1	0	0	1	0	0	6	0	0				4	0	0	
Pawnee Prairie NA	2	0	0	3	0	0	5	0	0	8	0	0				5	0	0	
Peterson** (area changed)	0	0	0	0	0	0				0	0	0				0	0	0	
Pleasant Run Creek																1	0	0	
Prairie Fork	2	0	0							0	0	0				2	0	0	
Providence**	3	0	0	9	0	0	13	0.136	0.26	14	0.139	0.38	17	0.149	0.37	19	0.17	0.24	0.034
Redwing	2	0	0							6	0	0				9	0	0	
Schwartz	0	0	0													5	0	0	
Shawnee Trails	33	0.119	0.22	81	0.166	0.17				61	0.088	0.16				111	0.148	0.12	0.029
Shelton	0	0	0	3	0	0	5	0	0	4	0	0				4	0	0	
Stony Point				25	0.126	0.31	53	0.227	0.15	49	0.252	0.13	59	0.231	0.1	68	0.267	0.1	0.141
Taberville	16	0.091	0.29	35	0.167	0.21	70	0.139	0.31	52	0.148	0.19	73	0.198	0.19	77	0.209	0.22	0.118

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Talbot	25	0.05	0.22				42	0.068	0.18	37	0.056	0.21	45	0.062	0.3	44	0.06	0.21	0.01
Van Meter State Park (Utz Tract)													1	0	0	0	0	0	
Wah'Kon-Tah	51	0.127	0.16	84	0.166	0.12	227	0.179	0.11	107	0.143	0.12	201	0.232	0.1	201	0.265	0.11	0.138

DICKCISSEL

Changes in Dickcissel density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. Some data are not applicable (N/A) for 2013 as weather conditions resulted in a very late migration season, precluding accurate detections for this long-distance migrant on some properties.



Dickcissel (DICK)

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													9	0	0	1	0	0	
Bruns Tract	20	0.981	0.3	17	0.835	0.3	20	0.652	0.18				18	0.432	0.14	23	0.604	0.21	-0.377
Brush Creek Ranch																83	0.259	0.15	
Buffalo Wallow	61	0.357	0.29	143	0.936	0.13				246	0.985	0.19				197	0.761	0.2	0.404
Bushwhacker	191	0.382	0.12	223	0.447	0.1				278	0.437	0.12				426	0.633	0.11	0.251
Clear Creek	21	N/A	0.42	76	0.679	0.19				104	0.648	0.23				112	0.685	0.1	0.006
Comstock	6	N/A	0							29	0.331	0.45				44	0.493	0.23	0.162
Coyne/Penn/Welch	36	0.392	0.27				83	0.693	0.18				154	0.946	0.16	147	0.989	0.12	0.597
Dennison Prairie	33	0.647	0.11													99	1.332	0.11	0.685
Diamond Grove (main unit)**	5	N/A	0	88	0.785	0.11	178	0.7	0.11	187	0.604	0.08	151	0.558	0.12	122	0.684	0.13	-0.101
Diamond Grove (grazed unit)	19	N/A	0	64	1.572	0.03	63	0.578	0.17	78	0.587	0.17	128	0.864	0.14	105	0.776	0.14	-0.796
Drovers	8	0	0	16	1.121	0.27	8	0	0							23	1.106	0.12	
Drywood	0	0	0							3	0	0				3	0	0	
Frank*	169	0.385	0.12	178	0.46	0.11				145	0.256	0.12				217	0.374	0.1	-0.011
Friendly	2	0	0				8	0	0							10	0	0	
Grandfather**	3	0	0				21	0.755	0.05							4	0	0	
Helton				33	0.27	0.44	27	0.188	0.26	32	0.186	0.32				55	0.367	0.38	0.097
Hi-Lonesome	57	0.559	0.3	76	0.746	0.18	90	0.365	0.19	90	0.332	0.19	33	0.191	0.33	124	0.273	0.19	-0.286
Hodges																8	0	0	
Horse Creek	5	0	0				26	0.777	0.26							65	1.567	0.02	0.79
Indigo***	6	0	0							5	0	0				12	0.873	0.2	
Kearn (WR)**	20	0.654	0.06	54	1.326	0.12	31	0.647	0.23				31	0.476	0.23	29	0.487	0.24	-0.167
Kickapoo**	2	N/A	0	31	1.523	0.23	41	0.57	0.27	89	1.016	0.22	89	0.911	0.36	84	0.942	0.15	-0.581
Lattner Prairie	13	0.637	0.54													12	0.808	0.2	0.171
Little Osage	5	0	0							12	0.822	0.03				15	1.101	0.2	0.279

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Mo-No-I	31	0.76	0.23							62	0.835	0.25				54	0.714	0.12	-0.046
Monegaw							45	0.828	0.1	34	0.513	0.17				51	0.756	0.19	-0.072
Mora***	43	0.469	0.22	80	0.873	0.2	110	0.472	0.18				35	0.214	0.27	74	0.535	0.2	0.066
Morton (Tillman)	64	0.523	0.21	82	0.671	0.24				63	0.392	0.25				122	0.911	0.11	0.388
Niawathe	29	0.474	0.17	59	0.956	0.1	68	0.956	0.09							134	1.503	0.12	1.029
Osage	127	0.461	0.13	153	0.557	0.07				252	0.664	0.11				317	0.785	0.07	0.324
Pawnee Prairie CA	44	0.479	0.13	62	0.677	0.06	36	0.333	0.2	38	0.285	0.26				64	0.478	0.22	0.000
Pawnee Prairie NA	21	0.229	0.26	59	0.644	0.21	52	0.482	0.3	37	0.248	0.2				65	0.483	0.2	0.254
Peterson** (area changed)	33	0.294	0.26	39	0.245	0.25				20	0.106	0.28				62	0.322	0.16	0.028
Pleasant Run Creek																26	0.875	0.54	
Prairie Fork	27	0.265	0.34							6	0	0				30	0.207	0.23	-0.058
Providence**	9	N/A	0	50	1.637	0.14	37	0.386	0.17	124	1.062	0.18	191	1.467	0.17	115	0.967	0.15	-0.67
Redwing	14	0.657	0.04							62	2.124	0.5				36	1.211	0.22	0.554
Schwartz	15	0.368	0.08													46	0.774	0.11	0.406
Shawnee Trails	248	0.737	0.08	435	0.872	0.07				685	0.85	0.09				812	1.008	0.06	0.271
Shelton	57	0.932	0.15	96	1.571	0.14	77	1.085	0.13	183	2.117	0.16				93	1.057	0.16	0.125
Stony Point				98	0.482	0.11	107	0.458	0.12	96	0.424	0.14	211	0.721	0.09	185	0.682	0.12	0.200
Taberville	119	0.556	0.1	220	1.029	0.09	298	0.592	0.11	380	0.929	0.13	376	0.888	0.1	275	0.703	0.06	0.147
Talbot	106	0.176	0.17				75	0.122	0.2	131	0.171	0.16	247	0.299	0.13	311	0.40	0.11	0.226
Van Meter State Park (Utz Tract)													37	0.683	0.09	25	0.506	0.2	-0.177
Wah'Kon-Tah	184	0.376	0.11	361	0.695	0.09	428	0.337	0.1	324	0.371	0.11	465	0.469	0.12	389	0.48	0.11	0.107

EASTERN MEADOWLARK



Eastern Meadowlark (EAME)

Changes in Eastern Meadowlark density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													9	0	0	3	0	0	
Bruns Tract	3	0	0	8	0	0	29	0.711	0.27				11	0.193	0.48	22	0.374	0.05	
Brush Creek Ranch																68	0.138	0.23	
Buffalo Wallow	2	0	0	12	0.052	0.31				27	0.089	0.24				17	0.042	0.44	-0.01
Bushwhacker	38	0.049	0.23	23	0.030	0.27				51	0.066	0.27				41	0.039	0.24	-0.01
Clear Creek	4	0	0	15	0.088	0.46				12	0.062	0.34				6	0	0	-0.026
Comstock	1	0	0							11	0.104	0.41				8	0	0	
Coyne/Penn/Welch	11	0.078	0.47				31	0.195	0.41				48	0.215	0.17	37	0.161	0.25	0.083
Dennison Prairie	1	0	0													16	0.139	0.24	

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Diamond Grove (main unit)**	17	0.121	0.31	17	0.1	0.31	111	0.328	0.17	89	0.238	0.12	79	0.213	0.09	58	0.21	0.15	0.089
Diamond Grove (grazed unit)	7	0	0	16	0.259	0.45	41	0.263	0.2	42	0.262	0.11	44	0.217	0.14	38	0.182	0.16	-0.077
Drovers	2	0	0	5	0	0	6	0	0							4	0	0	
Drywood										0	0	0				0	0	0	
Frank*	69	0.103	0.17	56	0.095	0.15				106	0.155	0.13				82	0.091	0.13	-0.012
Friendly	2	0	0				3	0	0							2	0	0	
Grandfather**	1	0	0				2	0	0							2	0	0	
Helton				3	0	0	4	0	0	3	0	0				8	0	0	
Hi-Lonesome	75	0.481	0.72	22	0.142	0.26	68	0.207	0.13	78	0.238	0.122	22	0.093	0.27	59	0.084	0.19	-0.397
Hodges																0	0	0	
Horse Creek	1	0	0				10	0.225	0.11							15	0.234	0.2	
Indigo***	0	0	0							2	0	0				5	0	0	
Kearn (WR)**	6	0	0	12	0.194	0.37	19	0.298	0.14				22	0.247	0.24	19	0.207	0.23	0.013
Kickapoo**	1	0	0	2	0	0	14	0.146	0.52	11	0.104	0.55	14	0.105	0.19	8	0	0	
Lattner Prairie	1	0	0													5	0	0	
Little Osage	0	0	0							2	0	0				2	0	0	
Mo-No-I	7	0	0							17	0.189	0.18				28	0.239	0.13	0.05
Monegaw							20	0.276	0.4	13	0.163	0.21				13	0.125	0.11	-0.151
Mora***	9	0	0	13	0.093	0.51	33	0.106	0.26				5	0	0	2	0	0	
Morton (Tillman)	9	0	0	23	0.124	0.26				6	0	0				8	0	0	
Niawathe	5	0	0	9	0	0	13	0.136	0.28							9	0	0	
Osage	27	0.064	0.2	31	0.074	0.16				58	0.127	0.18				50	0.08	0.14	0.016
Pawnee Prairie CA	17	0.121	0.36	7	0	0	27	0.188	0.27	6	0	0				5	0	0	
Pawnee Prairie NA	10	0.071	0.39	16	0.115	0.14	16	0.111	0.25	17	0.095	0.22				16	0.078	0.42	0.007
Peterson** (area changed)	17	0.099	0.31	23	0.114	0.33				38	0.167	0.26				32	0.108	0.21	0.009
Pleasant Run Creek																5	0	0	
Prairie Fork	5	0	0							2	0	0				0	0	0	
Providence**	2	0	0	9	0	0	15	0.118	0.08	18	0.128	0.19	43	0.241	0.18	18	0.098	0.14	-0.02
Redwing	2	0	0							11	0.312	0.09				5	0	0	
Schwartz	1	0	0													7	0	0	
Shawnee Trails	29	0.056	0.3	74	0.098	0.15				94	0.096	0.11				120	0.096	0.12	0.04
Shelton	12	0.128	0.32	31	0.334	0.21	13	0.138	0.19	20	0.192	0.42				9	0	0	
Stony Point				33	0.107	0.19	46	0.148	0.2	28	0.103	0.16	42	0.105	0.18	30	0.072	0.19	-0.035
Taberville	43	0.131	0.19	61	0.188	0.18	117	0.175	0.14	124	0.251	0.14	123	0.212	0.13	73	0.121	0.11	-0.01
Talbot	11	0.012	0.36				19	0.023	0.31	26	0.028	0.24	72	0.064	0.19	61	0.051	0.18	0.039
Van Meter State Park (Utz Tract)													0	0	0	1	0	0	
Wah'Kon-Tah	71	0.095	0.14	139	0.176	0.14	188	0.111	0.12	126	0.119	0.13	192	0.141	0.1	94	0.076	0.13	-0.019

FIELD SPARROW



Field Sparrow (FISP)

Changes in Field Sparrow density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													0	0	0	3	0	0	
Bruns Tract	1	0	0	0	0	0	1	0	0				0	0	0	0	0	0	
Brush Creek Ranch																21	0.051	0.25	
Buffalo Wallow Prairie CA	6	0	0	10	0.062	0.41				19	0.085	0.32				30	0.089	0.2	0.027
Bushwacker Lake CA	21	0.046	0.26	15	0.029	0.29				61	0.107	0.17				103	0.119	0.13	0.073
Clear Creek CA	15	0.147	0.39	17	0.145	0.38				25	0.174	0.26				14	0.067	0.37	-0.08
Comstock Prairie CA	6	0	0							5	0	0				11	0.096	0.38	
Coyne-Penn-Welsch	4	0	0				4	0	0				2	0	0	9	0	0	
Denison Prairie	0	0	0													1	0	0	
Diamond Grove Prairie CA	0	0	0	0	0	0	2	0	0	2	0	0	3	0	0	6	0	0	
Diamond Grove Prairie CA-PBG	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
Drovers Prairie CA	0	0	0	1	0	0	1	0	0							2	0	0	
Drywood CA	1	0	0							1	0	0				0	0	0	
Frank	38	0.095	0.23	24	0.059	0.26				12	0.024	0.36				15	0.02	0.33	-0.075
Friendly Prairie CA	0	0	0				0	0	0							2	0	0	
Grandfather Prairie CA	3	0	0				3	0	0							3	0	0	
Helton (The Wayne) Mem WA				30	0.235	0.25	28	0.205	0.27	47	0.305	0.16				41	0.212	0.25	-0.023
Hi Lonesome Prairie CA	58	0.626	0.5	7	0	0	17	0.073	0.32	27	0.111	0.33	13	0.089	0.31	43	0.073	0.22	-0.553
Hodges																9	0	0	
Horse Creek Prairie CA	0	0	0				0	0	0							2	0	0	
Indigo Prairie CA	0	0	0							0	0	0				0	0	0	
Kearn (W.R.) Memorial CA	0	0	0	6	0	0	0	0	0				5	0	0	6	0	0	
Kickapoo Prairie CA	1	0	0	2	0	0	1	0	0	4	0	0	9	0	0	8	0	0	
Lattner Prairie	0	0	0													3	0	0	
Little Osage CA	0	0	0							0	0	0				2	0	0	
Mo-No-I Prairie CA	0	0	0							1	0	0				2	0	0	
Monegaw Prairie CA							0	0	0	2	0	0				8	0	0	
Mora CA	24	0.288	0.3	26	0.271	0.29	50	0.226	0.25				29	0.212	0.18	22	0.123	0.25	-0.165

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Morton	11	0.099	0.35	12	0.093	0.39				23	0.159	0.25				32	0.185	0.23	0.086
Niawathe Prairie CA	2	0	0	3	0	0	9	0	0							9	0	0	
Osage Prairie CA	7	0	0	3	0	0				13	0.038	0.34				35	0.067	0.22	
Pawnee Prairie	7	0	0	9	0	0	10	0.098	0.36	8	0	0				3	0	0	
Pawnee Prairie NA	2	0	0	5	0	0	12	0.117	0.32							14	0.081	0.24	
Peterson	4	0	0	12	0.087	0.53				11	0.065	0.3				21	0.085	0.27	
Pleasant Run Creek																5	0	0	
Prairie Fork CA	27	0.291	0.29							30	0.215	0.3				24	0.128	0.21	-0.163
Premium Standard Farms	0	0	0	0	0	0	2	0	0	5	0	0	10	0	0	4	0	0	
Redwing Prairie CA	0	0	0							4	0	0				5	0	0	
Schwartz Prairie	0	0	0													3	0	0	
Shawnee Trail CA	10	0.033	0.34	37	0.071	0.24				50	0.069	0.18				47	0.045	0.14	0.012
Shelton (Wade & June) Memorial CA	1	0	0	2	0	0	1	0	0	7	0	0				2	0	0	
Stony Point CA				19	0.089	0.3	35	0.158	0.25	31	0.153	0.19	49	0.199	0.14	44	0.126	0.15	0.037
Taberville Prairie CA	2	0	0	23	0.103	0.3	27	0.056	0.24	17	0.046	0.28	55	0.155	0.18	36	0.071	0.22	-0.032
Talbot (Robert E) CA	47	0.086	0.2				106	0.181	0.14	97	0.141	0.13	152	0.22	0.1	162	0.162	0.08	0.076
Van Meter SP (Utz)													12	0.285	0.32	6	0	0	
Wah'Kon-Tah Prairie (MDC/TNC)	32	0.072	0.23	75	0.138	0.18	130	0.108	0.22	64	0.082	0.16	165	0.199	0.12	77	0.074	0.14	0.002

GRASSHOPPER SPARROW

Changes in Grasshopper Sparrow density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.



Grasshopper Sparrow (GRSP)

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													0	0	0	0	0	0	
Bruns Tract	4	0	0	1	0	0	0	0	0				0	0	0	0	0	0	
Brush Creek Ranch																42	0.136	0.22	
Buffalo Wallow	4	0	0	2	0	0				0	0	0				0	0	0	
Bushwhacker	12	0.022	0.39	4	0	0				2	0	0				0	0	0	
Clear Creek	22	0.183	0.37	2	0	0				7	0	0				0	0	0	
Comstock	12	0.183	0.55							2	0	0				0	0	0	

Coyne/Penn/Welch	12	0.122	0.45			37	0.293	0.3			15	0.079	0.4	21	0.146	0.41	0.024		
Dennison Prairie	0	0	0											0	0	0			
Diamond Grove (main unit)**	16	0.163	0.26	21	0.159	0.37	87	0.324	0.17	22	0.062	0.26	33	0.105	0.26	10	0	0	
Diamond Grove (grazed unit)	16	0.366	0.18	9	0	0	20	0.174	0.38	11	0.073	0.17	12	0.069	0.11	10	0	0	
Drovers	9	0	0	10	0.597	0.03	0	0	0					0	0	0			
Drywood	0	0	0							0	0	0		0	0	0			
Frank*	138	0.294	0.12	145	0.319	0.12				128	0.199	0.12		209	0.373	0.1	0.079		
Friendly	3	0	0				0	0	0					0	0	0	0		
Grandfather**	0	0	0				1	0	0					0	0	0	0		
Helton				2	0	0	8	0	0	13	0.067	0.54		15	0.104	0.73			
Hi-Lonesome	96	0.879	0.54	12	0.1	0.24	11	0.042	0.72	12	0.039	0.65	3	0	0	8	0	0	-0.84
Hodges														0	0	0			
Horse Creek	2	0	0				5	0	0					0	0	0			
Indigo***	0	0	0							0	0	0		0	0	0			
Kearn (WR)**	1	0	0	11	0.23	0.52	4	0	0				0	0	0				
Kickapoo**	2	0	0	3	0	0	6	0	0	6	0	0	4	0	0				
Lattner Prairie	0	0	0											0	0	0			
Little Osage	4	0	0							0	0	0		0	0	0			
Mo-No-I	3	0	0							3	0	0		2	0	0			
Monegaw							27	0.471	0.32	0	0	0		2	0	0			
Mora***	12	0.122	0.31	6	0	0	0	0	0				0	0	0				
Morton (Tillman)	3	0	0	19	0.132	0.4				0	0	0		2	0	0			
Niawathe	9	0	0	9	0	0	3	0	0					2	0	0			
Osage	37	0.126	0.21	3	0	0				6	0	0		0	0	0			
Pawnee Prairie CA	27	0.275	0.24	17	0.158	0.34	12	0.105	0.55	3	0	0		0	0	0	-0.17		
Pawnee Prairie NA	15	0.153	0.38	23	0.214	0.27	15	0.132	0.38	2	0	0		2	0	0			
Peterson** (area changed)	7	0	0	22	0.142	0.34				21	0.099	0.29		45	0.242	0.26	0.1		
Pleasant Run Creek														0	0	0			
Prairie Fork	1	0	0							0	0	0		2	0	0			
Providence**	0	0	0	1	0	0	1	0	0	2	0	0	5	0	0				
Redwing	1	0	0							0	0	0		0	0	0			
Schwartz	0	0	0											0	0	0			
Shawnee Trails	1	0	0	0	0	0				0	0	0		0	0	0			
Shelton	8	0	0	21	0.293	0.35	15	0.2	0.56	4	0	0		1	0	0			
Stony Point				16	0.067	0.38	26	0.106	0.4	9	0	0	11	0.032	0.41	3	0	0	
Taberville	8	0	0	35	0.139	0.21	7	0	0	4	0	0	1	0	0	4	0	0	
Talbot	17	0.026	0.28				38	0.058	0.29	8	0	0	34	0.036	0.32	26	0.035	0.27	0.009
Van Meter State Park (Utz Tract)													0	0	0	0	0	0	
Wah'Kon-Tah	17	0.032	0.36	48	0.078	0.27	59	0.044	0.26	23	0.023	0.29	25	0.022	0.36	23	0.030	0.31	-0.003

HENSLOW'S SPARROW



Henslow's Sparrow (HESP)

Changes in Henslow's Sparrow density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

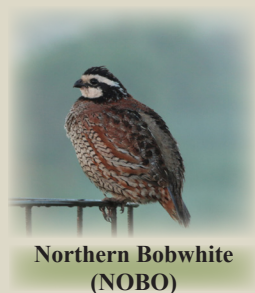
Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			543 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS													0	0	0	0	0	0	
Bruns Tract	10	0.459	0.03	8	0	0	53	1.828	0.12				25	0.689	0.1	9	0	0	
Brush Creek Ranch	3	0	0	4	0	0	2	0	0				10	0	0	1	0	0	
Buffalo Wallow	2	0	0	31	0.217	0.43				50	0.188	0.4				28	0.115	0.42	
Bushwhacker	26	0.048	0.3	30	0.064	0.27				28	0.041	0.29				71	0.112	0.2	0.064
Clear Creek	12	0.1	0.49	23	0.219	0.56				37	0.216	0.43				34	0.221	0.35	0.121
Comstock	0	0	0							6	0	0				18	0.215	0.3	
Coyne/Penn/Welch	5	0	0				14	0.123	0.37				32	0.226	0.37	25	0.179	0.44	0.056
Dennison Prairie	4	0	0													15	0.215	0.36	
Diamond Grove (main unit)**	8	0	0	26	0.248	0.32	58	0.241	0.28	28	0.085	0.3	68	0.289	0.19	13	0.078	0.66	-0.17
Diamond Grove (grazed unit)	1	0	0	13	0.342	0.61	16	0.155	0.55	22	0.155	0.56	22	0.171	0.2	20	0.157	0.45	-0.185
Drovers	4	0	0	2	0	0	6	0	0							5	0	0	
Drywood	0	0	0													0	0	0	
Frank*	40	0.086	0.36	36	0.099	0.35				56	0.093	0.35				23	0.042	0.53	-0.044
Friendly	2	0	0				3	0	0							3	0	0	
Grandfather**	0	0	0				4	0	0							0	0	0	
Helton				3	0	0	0	0	0	0	0	0				0	0	0	
Hi-Lonesome	27	0.248	0.49	58	0.609	0.13	50	0.214	0.25	85	0.294	0.22	62	0.411	0.19	51	0.119	0.31	-0.129
Hodges																0	0	0	
Horse Creek	0	0	0				5	0	0							9	0	0	
Indigo***	0	0	0							0	0	0				0	0	0	
Kearn (WR)**	2	0	0	3	0	0	4	0	0				13	0.229	0.37	1	0	0	
Kickapoo**	0	0	0	9	0	0	9	0	0	4	0	0	17	0.2	0.56	9	0	0	
Lattner Prairie	0	0	0													0	0	0	
Little Osage	0	0	0							1	0	0				0	0	0	
Mo-No-I	6	0	0							14	0.177	0.75				33	0.464	0.43	
Monegaw							20	0.389	0.35	22	0.312	0.19				15	0.237	0.51	-0.152
Mora***	8	0	0	5	0	0	12	0.054	0.59				13	0.091	0.43	0	0	0	
Morton (Tillman)	6	0	0	16	0.14	0.42				14	0.081	0.48				32	0.254	0.29	0.195
Niawathe	24	0.368	0.24	23	0.403	0.37	20	0.294	0.22							17	0.203	0.11	-0.165
Osage	32	0.109	0.24	22	0.086	0.23				43	0.106	0.28				87	0.229	0.21	0.12

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Pawnee Prairie CA	8	0	0	5	0	0	45	0.441	0.19	20	0.141	0.43				27	0.215	0.51	
Pawnee Prairie NA	12	0.123	0.42	17	0.199	0.31	18	0.176	0.34	20	0.126	0.35				5	0	0	
Peterson** (area changed)	2	0	0	1	0	0				1	0	0				5	0	0	
Pleasant Run Creek																2	0	0	
Prairie Fork	18	0.166	0.38							11	0	0				4	0	0	
Providence**	6	0	0	29	1.016	0.45	9	0	0	7	0	0	12	0.106	0.89	19	0.17	0.32	
Redwing	0	0	0							6	0	0				0	0	0	
Schwartz	13	0.289	0.61													31	0.555	0.25	0.266
Shawnee Trails	11	0.031	0.43	4	0	0				5	0	0				33	0.044	0.32	0.013
Shelton	19	0.291	0.48	47	0.823	0.41	7	0	0	6	0	0				23	0.278	0.61	-0.013
Stony Point				29	0.152	0.31	24	0.109	0.35	22	0.091	0.35	36	0.141	0.32	47	0.184	0.33	0.032
Taberville	51	0.223	0.17	120	0.601	0.2	128	0.269	0.17	148	0.399	0.21	166	0.451	0.13	140	0.381	0.16	0.158
Talbot	0	0	0				0	0	0	0	0	0	19	0.027	0.43	25	0.034	0.33	
Van Meter State Park (Utz Tract)													0	0	0	0	0	0	
Wah'Kon-Tah	64	0.123	0.17	164	0.338	0.19	260	0.216	0.1	186	0.199	0.15	301	0.348	0.12	190	0.251	0.16	0.128

NORTHERN BOBWHITE

Changes in Northern Bobwhite density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.



Northern Bobwhite (NOBO)

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Arrow Rock SHS							4	0	0				0	0	0	0	0	0	
Bruns Tract	0	0	0	3	0	0	18	0.356	0.36				7	0	0	11	0.13	0.38	
Brush Creek Ranch																9	0	0	
Buffalo Wallow	0	0	0	8	0	0				11	0.033	0.38				7	0	0	
Bushwhacker	6	0	0	11	0.009	0.35				55	0.065	0.16				54	0.036	0.17	
Clear Creek	1	0	0	5	0	0				13	0.061	0.3				9	0	0	
Comstock	0	0	0							5	0	0				8	0	0	
Coyne/Penn/Welch	0	0	0				2	0	0				8	0	0	3	0	0	
Dennison Prairie	1	0	0													8	0	0	
Diamond Grove (main unit)**	1	0	0	8	0	0	6	0	0	8	0	0	11	0.025	0.28	3	0	0	
Diamond Grove (grazed unit)	0	0	0	3	0	0	6	0	0	0	0	0	6	0	0	2	0	0	
Drovers	0	0	0	1	0	0	1	0	0							2	0	0	
Drywood	0	0	0							0	0	0				0	0	0	

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Frank*	19	0.019	0.3	11	0.013	0.39				21	0.028	0.36				21	0.016	0.27	-0.003
Friendly	0	0	0				0	0	0							0	0	0	
Grandfather**	0	0	0				3	0	0							3	0	0	
Helton				6	0	0	13	0.055	0.23	22	0.096	0.24				9	0	0	
Hi-Lonesome	1	0	0	9	0	0	13	0.032	0.16	55	0.152	0.17	24	0.087	0.26	42	0.042	0.21	
Hodges													11	0.079	0.046				
Horse Creek	0	0	0				1	0	0							3	0	0	
Indigo***	0	0	0							0	0	0				3	0	0	
Kearn (WR)**	0	0	0	4	0	0	4	0	0				6	0	0	10	0	0	
Kickapoo**	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	
Lattner Prairie	0	0	0													1	0	0	
Little Osage	0	0	0							1	0	0				1	0	0	
Mo-No-I	0	0	0							1	0	0				4	0	0	
Monegaw							2	0	0	2	0	0				5	0	0	
Mora***	3	0	0	6	0	0	16	0.042	0.29				2	0	0	0	0	0	
Morton (Tillman)	3	0	0	15	0.055	0.24				3	0	0				16	0.054	0.23	
Niawathe	1	0	0	10	0.074	0.4	4	0	0							7	0	0	
Osage	5	0	0	7	0	0				37	0.073	0.2				37	0.041	0.2	
Pawnee Prairie CA	5	0	0	10	0.049	0.35	5	0	0	3	0	0				10	0	0	
Pawnee Prairie NA	0	0	0	9	0	0	5	0	0	12	0.061	0.41				8	0	0	
Peterson** (area changed)	0	0	0	3	0	0				4	0	0				7	0	0	
Pleasant Run Creek																3	0	0	
Prairie Fork	1	0	0							8	0	0				13	0.04	0.32	
Providence**	1	0	0	2	0	0	10	0.063	0.12	14	0.09	0.19	15	0.072	0.32	7	0	0	
Redwing	0	0	0							2	0	0				0	0	0	
Schwartz	0	0	0													7	0	0	
Shawnee Trails	9	0	0	33	0.029	0.19				40	0.037	0.25				43	0.024	0.21	
Shelton	0	0	0	12	0.088	0.47	3	0	0	2	0	0				2	0	0	
Stony Point				11	0.024	0.41	28	0.073	0.24	11	0.037	0.25	24	0.051	0.22	17	0.028	0.25	0.004
Taberville	0	0	0	15	0.032	0.32	22	0.026	0.28	20	0.037	0.32	42	0.062	0.2	25	0.029	0.24	-0.003
Talbot	4	0	0				8	0	0	16	0.016	0.3	24	0.012	0.22	7	0	0	
Van Meter State Park (Utz Tract)													0	0	0	0	0	0	
Wah'Kon-Tah	13	0.012	0.33	64	0.056	0.11	96	0.046	0.13	55	0.047	0.17	128	0.081	0.14	58	0.032	0.14	0.02

UPLAND SANDPIPER



Upland Sandpiper (UPSA)

Changes in Upland Sandpiper density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. The range of the Upland Sandpiper potentially includes all COAs and CCSs surveyed but it is rarely encountered. The table below includes all Missouri properties where Upland Sandpipers were detected in 2013 - 2017 surveys.

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Coyne/Penn/Welch	0	0	0				0	0	0				1	0	0	0	0	0	
Diamond Grove (main unit)**	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Frank*	0	0	0	0	0	0				2	0	0				3	0	0	
Hi-Lonesome	3	0	0	1	0	0	15	0.051	0.48	16	0.032	0.6	2	0	0	3	0	0	
Horse Creek	0	0	0				3	0	0							0	0	0	
Peterson** (area changed)	1	0	0	0	0	0				0	0	0				0	0	0	
Shawnee Trails	0	0	0	1	0	0				0	0	0				0	0	0	
Shelton	0	0	0	0	0	0	2	0	0	0	0	0				0	0	0	

BOBOLINK



Bobolink (BOBO)

Changes in Bobolink density across years in northern Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change is obtained from change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. In Missouri, Bobolink breed only in the northern part of the state; they are passage migrants in the remainder.

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Brush Creek Ranch																1	0	0	
Bushwhacker	0	0	0	0	0	0				2	0	0				1	0	0	
Diamond Grove (main unit)**	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Drovers	0	0	0	2	0	0	0	0	0							0	0	0	
Frank*	233	0.412	0.13	208	0.486	0.17				161	0.449	0.21				99	0.156	0.17	-0.256
Kearn (WR)**	1	0	0	0	0	0	1	0	0				0	0	0	0	0	0	
Mora***	4	0	0	0	0	0	0	0	0				0	0	0	0	0	0	
Niawathe	1	0	0	0	0	0	0	0	0							0	0	0	
Pawnee Prairie CA	24	0.203	0.3	29	0.286	0.31	32	0.402	0.25	29	0.344	0.4				21	0.143	0.33	-0.06
Pawnee Prairie NA	10	0.085	0.38	38	0.375	0.52	6	0	0	9	0	0				5	0	0	
Peterson** (area changed)	18	0.125	0.29	43	0.294	0.23				72	0.605	0.31				31	0.147	0.39	0.022
Shawnee Trails	0	0	0	2	0	0				140	0.274	0.48				0	0	0	
Shelton	1	0	0	0	0	0	0	0	0	0	0	0				0	0	0	

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Stony Point				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taberville	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
Talbot	0	0	0				0	0	0	3	0	0	13	0.019	0.67	0	0	0	
Wah'Kon-Tah	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	

UNCOMMON AND/OR DECLINING SPECIES

There are several species considered grassland-obligate target species by MRBO and the MDC that have been extremely uncommon on 2013 - 2018 surveys. While readers of this report are aware of the scarcity of Greater Prairie-Chicken, the low numbers of Loggerhead Shrike and Common Nighthawk may be surprising. Below we provide observational data for each species as detected during transect surveys as well as opportunistically during the survey season.

SEDGE WREN



Sedge Wren (SEWR)

Changes in Sedge Wren density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year. Overall change is obtained from change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. The breeding range of the Sedge Wren includes northern and central Missouri. It is a highly nomadic species that typically undergoes two nesting cycles each breeding season, often moving long distances between cycles.

Property	2013			2014			2015			2016			2017			2018			Change in Density, first to last survey year
	762 transects			615 transects			471 transects			543 transects			400 transects			589 transects			
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Bushwacker	0	0	0	0	0	0				1	0	0				0	0	0	
Drovers	0	0	0	1	0	0	0	0	0							0	0	0	
Frank*	2	0	0	0	0	0				21	0.038	0.48				0	0	0	
Hi-Lonesome	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	
Pawnee Prairie CA	2	0	0	0	0	0	2	0	0	11	0.085	0.33				0	0	0	
Pawnee Prairie NA	3	0	0	2	0	0	5	0	0	47	0.325	0.21				0	0	0	
Prairie Fork	2	0	0							0	0	0				0	0	0	
Shawnee Trails	0	0	0	5	0	0				1	0	0				9	0	0	
Talbot	0	0	0				0	0	0	1	0	0	0	0	0	0	0	0	
Wah'Kon-Tah	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	

GREATER PRAIRIE-CHICKEN



Greater Prairie-Chicken (GRPC)

Greater Prairie-Chickens have been detected on Dunn Ranch, the Frank Ranch, Poteet Farms and Pawnee Prairie in the Grand River Grasslands CCS, on Taberville and Wah'Kon-Tah Prairies in the Upper Osage Grasslands CCS, and near Wade & June Shelton Memorial Conservation Area. Eight were detected on Taberville CA and one was detected on Prairie CA in 2018.

Region	2013	2014	2015	2016	2017	2018
Grand River Grasslands	0	12	16	1	17	1
Upper Osage	0	7	8	12	5	8
Total	0	19	24	13	22	9

LOGGERHEAD SHRIKE

Loggerhead Shrikes have been detected on Dunn Ranch, the Leuken-Hensley Ranch, the Frank Ranch and Poteet Farms in the Grand River Grasslands CCS, on Hi Lonesome Prairie and Ionia Ridge in the Cole Camp Prairies COA, on Wah’Kon-Tah Prairie and the Morton property in the Upper Osage Grasslands CCS, and on the Theurer Ranch in the Golden Grasslands CCS.



Loggerhead Shrike (LOSH)

Region	2013	2014	2015	2016	2017	2018
Grand River Grasslands	0	10	5	2	8	5
Osage Plains	2	14	14	4	6	2
Total	2	24	19	6	14	7

COMMON NIGHTHAWK

The Common Nighthawk was historically a bird of the prairies, old fields and traditional farmsteads. It is now very scarce in Missouri during breeding season and most often found in towns. This species has been documented at Linscomb, Diamond Grove, Osage Prairie, Shawnee Trail, Stony Point, Talbot and Wah’Kon-tah.



Common Nighthawk (CONI)

Region	2013	2014	2015	2016	2017	2018
Grand River Grasslands	0	0	0	0	0	0
Osage Plains	0	6	0	4	10	4
Golden Prairies	0	6	0	0	0	2
Total	0	6	0	4	10	6

BIRD-FRIENDLINESS SCORES

Through a partnership with Audubon and the MDC, MRBO developed a scoring system to measure the bird use of grassland-obligate guild on a subset of sites that are part of the Audubon Conservation Ranching Program. The scores are based on the conservation value and density for each species and grassland-obligate diversity for the property. Conservation values for each species were determined by regional, state, and local expertise. Criteria for scoring include regional as well as national population trends, threats to wintering grounds, threats to breeding grounds, and other factors (PIF et al 2018). Current scores are in table Appendix A. After 2018 data compilation, we retroactively scored all grassland properties surveyed since 2012 to provide the most robust metric on the health of Missouri prairies currently available (Appendix B).

APPENDIX A: CRITERIA AND CONSERVATION VALUE SCORING

Common Name	MO Concern Score	Pop Trend, MO	Threats to Breeding, MO	Relative Density - Breeding MO	Population Size, Global	Breeding Distribution, Global
Field Sparrow	16	5	3	4	2	2
Northern Bobwhite	16	5	4	4	2	1
Grasshopper Sparrow	16	5	4	4	2	1
Henslow’s Sparrow	16	1	4	5	4	2
Bobolink	16	5	4	3	2	2
Dickcissel	15	2	4	5	2	2
Eastern Meadowlark	16	5	3	5	2	1
Greater Prairie-Chicken	16	5	4	1	3	3
Bell’s Vireo	11	2	3	2	2	2
Upland Sandpiper	17	5	4	3	3	2
Loggerhead Shrike	14	5	4	2	2	1
Sedge Wren	11	2	4	2	2	1
Common Nighthawk	12	4	3	2	2	1
Western Meadowlark	10	5	3	2	1	1

APPENDIX B: BIRD-FRIENDLINESS SCORES GRASSLAND SURVEYS SINCE 2012

Property	2018	2016	2014	2013	2012	Property	2018	2016	2014	2013	2012
Albertson	0.0	0.0	19.7	7.3	0.0	Koger East	0.0	0.0	0.0	25.7	14.3
Arrow Rock SHS	1.1	0.0	0.0	0.0	0.0	Kremp	0.0	0.0	24.5	0.0	0.0
Brauer	0.0	0.0	31.9	0.0	0.0	Lattner Prairie	18.3	0.0	0.0	2.5	0.0
Bruns Tract	25.4	0.0	18.9	27.0	0.0	Leuken-Hensley	0.0	0.0	35.5	0.0	0.0
Brush Creek Ranch	13.9	0.0	1.5	0.0	0.0	Linscomb WA	0.0	6.7	9.1	0.0	0.0
Bryson's Hope CA		0.0	25.2	30.4	0.0	Little Osage Prairie	18.4	12.3	0.0	0.7	0.0
Buffalo Wallow Prairie CA	22.4	28.5	25.1	7.1	0.0	Mo-No-I Prairie CA	31.7	23.8	0.0	12.8	0.0
Bushwacker Lake CA	23.3	21.7	12.2	13.9	0.0	Monegaw Prairie CA	29.8	21.9	0.0	0.0	0.0
Carpenter	0.0	6.2	25.0	10.4	18.9	Mora CA	11.2	0.0	29.9	28.0	0.0
Carver Prairie	0.0	5.5	0.0	0.0	0.0	Morris 1	0.0	0.0	0.6	0.6	0.0
Clapper	0.0	0.0	20.1	0.7	0.0	Morris 2	0.0	0.0	1.1	0.0	0.0
Clear Creek CA	23.1	34.3	32.8	N/A	0.0	Morris 3	0.0	0.0	1.3	0.7	0.0
Clubine	0.0	0.0	16.7	0.0	0.0	Morton	35.1	14.9	33.8	12.5	13.3
Comstock Prairie CA	22.2	13.8	0.0	N/A	0.0	Niawathe Prairie CA	31.9	0.0	34.1	18.9	0.0
Cook Meadow Prairie	0.0	0.0	0.0	6.5	0.0	Oberle	0.0	0.0	16.3	0.8	0.0
Coyne-Penn-Welsch	29.9	0.0	0.0	12.3	0.0	Osage Prairie CA	28.8	24.7	14.3	18.8	0.0
Denison Prairie	26.0	0.0	0.0	5.5	0.0	Paint Brush Prairie CA	0.0	0.0	38.4	24.0	0.0
Diamond Grove Prairie CA	19.4	19.4	31.5	N/A	0.0	Pawnee Prairie	19.1	25.1	29.3	31.0	0.0
Diamond Grove Prairie CA-PBG	20.7	20.6	43.0	N/A	0.0	Pawnee Prairie NA	15.0	22.6	44.5	18.9	0.0
Drovers Prairie CA	21.8	0.0	40.7	1.4	0.0	Peterson	24.3	25.1	22.5	11.8	0.0
Drywood CA	0.0	0.6	0.0	0.0	0.0	Pleasant Run Creek	16.2	0.0	0.0	0.0	0.0
Dunn Ranch	0.0	0.0	65.2	43.7	0.0	Poteet Farms	0.0	33.6	0.0	0.0	0.0
Eitel	0.0	0.0	1.3	0.0	0.0	Prairie Fork CA	8.1	4.7	0.0	17.1	0.0
Flying W L	0.0	0.0	0.0	14.7	8.5	Prairie State Park	0.0	0.0	0.0	29.5	0.0
Flying W North	0.0	0.0	0.0	14.1	9.4	Premium Standard Farms	0.0	0.0	8.4	0.0	0.0
Flying W Southeast	0.0	0.0	0.0	17.0	13.1	Providence Prairie CA	24.7	24.2	51.5	N/A	0.0
Francis	0.0	0.0	10.6	0.0	0.0	Redwing Prairie CA	18.3	40.4	0.0	8.4	0.0
Frank	28.2	36.8	41.9	37.1	17.8	Roeslein	0.0	0.0	16.0	0.0	0.0
Friendly Prairie CA	1.2	0.0	0.0	1.4	0.0	Runyon	0.0	5.4	0.0	0.0	0.0
George Washington Carver National Monument	0.0	0.0	0.0	6.0	0.0	Schell-Osage CA	0.0	8.8	14.1	0.0	0.0
Golden Prairie	0.0	0.0	0.0	7.5	0.0	Schwartz Prairie	27.9	0.0	0.0	8.3	0.0
Good-Night Henry Prairie	0.0	0.0	0.0	1.7	0.0	Sewell	0.0	14.2	0.0	0.0	0.0
Grandfather Prairie CA	1.6	0.0	0.0	1.3	0.0	Shackles	0.0	0.0	36.8	0.0	0.0
Harden 1	0.0	0.0	14.6	0.7	0.0	Shawnee Trail CA	22.2	26.5	21.8	14.2	0.0
Harden 2	0.0	0.0	29.8	1.0	0.0	Shelton (Wade & June) Memorial CA	19.5	27.0	72.9	24.6	0.0
Hartwell CA	0.0	0.0	15.5	1.7	0.0	Shoop	0.0	0.0	18.4	0.5	0.0
Haughbein	0.0	0.0	13.7	0.0	0.0	Simler	0.0	0.0	8.6	0.7	0.0
Helton (The Wayne) Mem WA	17.6	15.7	10.6	0.0	0.0	Sloan (Dr. O. E. & Eloise) CA	0.0	0.0	8.5	6.2	0.0
Hi Lonesome Prairie CA	18.0	39.5	43.6	85.7	0.0	Spring Creek	0.0	0.0	0.0	43.6	10.3
Hill	0.0	0.0	50.7	1.3	0.0	Stilwell Prairie	0.0	0.0	0.0	N/A	0.0
Hodges	1.4	0.0	0.0	0.0	0.0	Stony Point CA	30.0	25.9	26.2	0.0	0.0
Horse Creek Prairie CA	28.6	0.0	0.0	1.1	0.0	Taberville Prairie CA	35.8	38.8	56.5	19.8	0.0
Indigo Prairie CA	17.7	1.0	0.0	0.0	0.0	Talbot (Robert E) CA	16.2	9.4	0.0	7.1	0.0
Ionia Ridge CA	0.0	0.0	23.1	19.1	0.0	Theurer	0.0	0.0	40.9	0.0	0.0
Kearn (W.R.) Memorial CA	16.1	0.0	38.7	10.9	0.0	Van Meter SP (Utz)	4.1	0.0	0.0	0.0	0.0
Kickapoo Prairie CA	16.7	14.9	23.9	0.0	0.0	Wah'Kon-Tah Prairie (MDC/TNC)	29.1	24.9	43.0	20.1	0.0
King	0.0	0.0	10.1	0.7	0.0	Young	0.0	0.0	16.1	1.4	0.0
Koger Central	0.0	0.0	0.0	24.0	13.9						

