



Grassland Bird Surveys in Missouri's Priority Geographies
Breeding Seasons 2014-2019



The Missouri River Bird Observatory (MRBO) has been conducting breeding season surveys of grassland birds in Missouri since 2012. In 2013, MRBO and the Missouri Department of Conservation (MDC) formed a partnership to pursue long-term population monitoring on Missouri's most important publicly-managed grasslands and cooperating private lands. The overarching goals are to track the populations of our imperiled grassland bird species over time and to assess the effects of management activities. To address the latter, MRBO conducts a sub-study focused on bird response to patch-burn grazing which is reported in a separate document.

The standardized breeding season surveys are conducted using line-transect Distance sampling. Public and private properties are sampled on a yearly or every-other-year basis depending on their status as restoration sites, private cooperators, or sites undergoing concurrent MDC research. Thus, the number of sites surveyed is variable by year but represents an adequate sampling of available quality bird habitat within Priority Geographies (PG) or Conservation Opportunity Areas (COA). A small number of sites are surveyed outside of PGs and COAs, typically upon request of private cooperators and other NGO partners.

The resulting density estimates provide both an assessment of grassland bird population trends as well as a means by which to compare various geographies across the state. MRBO also evaluates the quality of bird habitat provided by each surveyed property by calculating a "bird-friendliness score". This score is a measure of a property's avian diversity and density coupled with an assessment of the conservation concern level of the bird species present. The following report displays the results of six years of breeding season surveys in Missouri's most important grassland landscapes.

Format of this report:

The following tables display grassland bird data from 2014 to 2019. Density estimates and associated coefficients of variance are only displayed when sample size exceeded 20 detections; if estimates were not possible, N is still reported while D and CV are denoted by a "-". Individual species are not included in tables if the species was never detected in a geography in any year.

N = number of individual birds detected

D = density estimate in birds per 100 acres

CV = coefficient of variance.

Please note that the following results are based on a spatially-explicit dataset of over 100,000 grassland bird detections. The full dataset is available to all project partners in ArcGIS Online. Please contact ethan.duke@mrbo.org for access.



Doug Hardesty

The Missouri River Bird Observatory is a 501(c)3 non-profit entity dedicated to the conservation of Missouri's migratory and resident birds through scientific research, community outreach, K-12 education and conservation policy advocacy.



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The MRBO Grassland Bird Survey Program is conducted in cooperation with



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Grand River Grasslands Priority Geography

Species	2014			2015			2016			2017			2018			2019		
	5 properties sampled			6 properties sampled			5 properties sampled			2 properties sampled			3 properties sampled			2 properties sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	11	-	-	18	-	-	17	-	-	17	-	-	12	-	-	9	-	-
Bobolink	814	54	0.09	479	49	0.11	226	28	0.17	498	54	0.11	150	17	0.17	242	79	0.18
Dickcissel	842	65	0.05	476	35	0.08	268	23	0.09	396	35	0.08	357	40	0.08	224	35	0.1
Eastern Meadowlark	245	13	0.08	275	16	0.09	189	14	0.1	176	12	0.09	107	8	0.13	113	13	0.11
Field Sparrow	47	3	0.19	69	6	0.18	47	4	0.19	46	5	0.21	32	3	0.22	46	7	0.2
Grasshopper Sparrow	428	0.27	0.08	257	0.18	0.11	218	17	0.12	62	5	0.2	215	28	0.14	48	6	0.2
Greater Prairie-Chicken	12	-	-	16	-	-	1	-	-	17	-	-	1	-	-	0	-	-
Henslow's Sparrow	175	14	0.14	256	20	0.11	142	12	0.18	109	11	0.16	55	7	0.35	100	17	0.12
Loggerhead Shrike	10	-	-	5	-	-	2	-	-	8	-	-	5	-	-	0	-	-
Northern Bobwhite	86	3	0.14	80	3	0.15	66	4	0.18	120	7	0.11	39	2	0.2	17	-	-
Sedge Wren	22	1	0.37	57	5	0.26	81	7	0.24	161	15	0.14	0	-	-	82	21	0.21
Upland Sandpiper	71	3	0.23	24	2	0.3	3	-	-	26	2	0.34	6	-	-	13	-	-
Grassland Obligate Guild	2776	180	0.04	2024	135	0.05	1269	115	0.07	1679	158	0.05	975	108	0.06	896	132	0.08

Notes:
 The populations of most grassland bird species, and the grassland obligate guild as a whole, have fluctuated mildly across years but remained relatively steady in this Priority Geography. For Grasshopper Sparrow, which prefer a sparser vegetation structure that is seldom available on public land, numbers fluctuate based primarily on whether or not the Frank Ranch is included in the sample; the Ranch was not surveyed in 2017 and 2019, causing a much lower sample size of this species. Northern Bobwhite and Upland Sandpiper numbers have declined since 2014. Sedge Wren numbers fluctuate based upon the breeding system of this species, which engages in a second nesting attempt in Missouri after first breeding further north; though MRBO surveys occur in the same late-June timeframe each year, Sedge Wren may or may not be present in significant numbers based on the species' breeding timing.

Upper Osage Grasslands Priority Geography

	2014			2015			2016			2017			2018			2019		
	6 properties sampled			7 properties sampled			7 properties sampled			5 properties sampled			4 properties sampled			4 properties sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	281	17	0.08	346	15	0.1	249	13	0.09	359	18	0.07	346	25	0.08	319	16	0.08
Common Nighthawk	0	-	-	0	-	-	0	-	-	6	-	-	0	-	-	0	-	-
Dickcissel	796	51	0.09	881	37	0.07	894	39	0.09	1006	46	0.08	917	59	0.06	819	39	0.08
Eastern Meadowlark	224	9	0.12	371	13	0.08	338	12	0.11	328	11	0.1	204	9	0.09	182	63	0.11
Field Sparrow	269	16	0.09	224	11	0.13	182	9	0.1	441	23	0.08	164	9	0.1	359	16	0.08
Grasshopper Sparrow	109	6	0.17	103	4	0.2	36	1	0.23	26	10	0.3	35	3	0.25	36	1	0.25
Greater Prairie-Chicken	5	-	-	8	-	-	12	-	-	2	-	-	8	-	-	10	-	-
Henslow's Sparrow	307	21	0.15	427	19	0.08	383	16	0.13	469	24	0.1	410	29	0.1	228	12	0.13
Loggerhead Shrike	5	-	-	6	-	-	0	-	-	2	-	-	0	-	-	0	-	-
Northern Bobwhite	126	3	0.11	130	3	0.12	88	3	0.14	212	6	0.1	117	4	0.13	166	4	0.11
Sedge Wren	0	-	-	0	-	-	0	-	-	5	-	-	1	-	-	0	-	-
Grassland Obligate Guild	2123	115	0.06	2493	94	0.04	2184	99	0.07	2952	139	0.05	2203	138	0.04	2118	95	0.05

Notes:

Grassland bird populations in the Upper Osage Grasslands Priority Geography have remained relatively stable over the past five years. Grasshopper Sparrow populations remain low, which is partially a reflection of few survey samples on private land in this region. Henslow's Sparrow displayed a slight decrease in 2019, while Eastern Meadowlark density significantly increased. Northern Bobwhite density has remained low but steady over the past six years.

Cole Camp Prairies Conservation Opportunity Area

	2014 11 properties sampled			2015 13 properties sampled			2016 1 property sampled			2017 10 properties sampled			2018 7 properties sampled			2019 7 properties sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	43	7	0.19	106	9	0.12	34	15	0.12	80	9	0.16	67	12	0.12	71	10	0.15
Dickcissel	490	85	0.07	546	46	0.07	90	33	0.15	321	31	0.12	296	47	0.09	326	41	0.08
Eastern Meadowlark	134	16	0.12	303	21	0.09	78	24	0.12	176	13	0.15	111	12	0.14	109	10	0.14
Field Sparrow	81	13	0.18	133	13	0.15	27	11	0.25	89	10	0.15	82	11	0.13	83	9	0.13
Grasshopper Sparrow	110	15	0.16	43	3	0.25	12	-	-	23	2	0.34	8	-	-	15	-	-
Henslow's Sparrow	109	20	0.18	192	17	0.17	85	29	0.21	191	21	0.15	69	12	0.25	32	4	0.35
Loggerhead Shrike	1	-	-	4	-	-	0	-	-	0	-	-	0	-	-	6	-	-
Northern Bobwhite	49	4	0.15	126	6	0.15	55	15	0.18	83	5	0.16	68	5	0.18	61	4	0.14
Sedge Wren	1	-	-	0	-	-	4	-	-	0	-	-	0	-	-	0	-	-
Upland Sandpiper	10	-	-	23	2	0.36	17	-	-	3	-	-	6	-	-	13	-	-
Grassland Obligate Guild	1028	151	0.05	1477	112	0.05	402	152	0.1	966	100	0.07	704	109	0.06	713	85	0.06

Notes:
Declines in some grassland bird populations in the Cole Camp Prairies Conservation Opportunity Area are likely a response to decreases in disturbance-oriented management in preceding years. Recent efforts by MDC Management Biologists to increase prescribed fire, woody cover control and grazing are anticipated to have positive effects on Grasshopper Sparrow, Henslow's Sparrow, Eastern Meadowlark and Dickcissel populations. Notably, Bell's Vireo, Field Sparrow and Northern Bobwhite numbers have remained steady since 2014.

Diamond Grove Conservation Opportunity Area

	2014 2 properties sampled			2015 2 properties sampled			2016 3 properties sampled			2017 2 properties sampled			2018 2 properties sampled			2019 3 properties sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	10	-	-	11	-	-	13	-	-	11	-	-	19	-	-	32	8	0.27
Common Nighthawk	3	-	-	0	-	-	0	-	-	0	-	-	1	-	-	4	-	-
Dickcissel	152	99	0.11	240	66	0.09	279	47	0.09	279	74	0.1	326	86	0.07	273	59	0.09
Eastern Meadowlark	33	15	0.28	154	34	0.12	167	24	0.11	126	25	0.08	153	28	0.11	125	20	0.1
Field Sparrow	0	-	-	2	-	-	3	-	-	5	-	-	7	-	-	16	-	-
Grasshopper Sparrow	30	16	0.25	107	28	0.15	33	5	0.2	45	10	0.21	26	8	0.28	35	6	0.26
Greater Prairie-Chicken	0	-	-	0	-	-	0	-	-	1	-	-	0	-	-	0	-	-
Henslow's Sparrow	39	27	0.28	74	22	0.21	52	8	0.24	90	27	0.15	54	16	0.24	63	15	0.2
Loggerhead Shrike	0	-	-	2	-	-	0	-	-	2	-	-	2	-	-	1	-	-
Northern Bobwhite	13	-	-	12	-	-	8	-	-	18	-	-	9	-	-	6	-	-
Upland Sandpiper	0	-	-	0	-	-	0	-	-	1	-	-	0	-	-	0	-	-
Grassland Obligate Guild	286	159	0.1	602	147	0.07	556	99	0.08	578	163	0.06	595	155	0.07	555	114	0.08

Notes:

Beneficial management coupled with the overall openness of the landscape in the Diamond Grove Conservation Opportunity Area have contributed to its relatively steady grassland bird populations. MRBO documented a slight decrease in densities of most species in 2019; future years' surveys will elucidate whether this is a trend or a temporary phenomenon. Results from 2016 show a similar dip in densities followed by an increase. Though the results from each surveyed site are not presented here, we note that the patch-burn grazing unit of Diamond Grove Prairie Conservation Area had higher densities of most grassland obligate species than the main western unit.

Golden Grasslands Conservation Opportunity Area

	2014 9 properties sampled			2015 12 properties sampled			2016 7 properties sampled			2017 10 properties sampled			2018 9 properties sampled			2019 16 properties sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	64	9	0.19	160	10	0.12	110	9	0.14	153	8	0.13	178	11	0.11	217	9	0.1
Common Nighthawk	0	-	-	0	-	-	3	-	-	4	-	-	2	-	-	2	-	-
Dickcissel	449	66	0.09	653	39	0.09	629	48	0.14	1398	68	0.08	1210	70	0.07	1265	48	0.07
Eastern Meadowlark	159	16	0.15	223	11	0.12	105	7	0.14	357	13	0.09	200	8	0.1	276	8	0.09
Field Sparrow	65	9	0.2	210	15	0.11	144	12	0.11	267	15	0.09	247	12	0.08	344	12	0.09
Grasshopper Sparrow	90	11	0.2	161	10	0.15	29	2	0.28	117	5	0.16	53	4	0.24	76	2	0.19
Greater Prairie-Chicken	0	-	-	0	-	-	0	-	-	2	-	-	0	-	-	0	-	-
Henslow's Sparrow	176	28	0.2	105	7	0.17	39	3	0.28	158	9	0.16	174	11	0.16	172	7	0.17
Loggerhead Shrike	8	-	-	2	-	-	0	-	-	2	-	-	0	-	-	2	-	-
Northern Bobwhite	53	3	0.2	77	3	0.16	43	2	0.18	102	3	0.13	56	2	0.18	94	2	0.12
Sedge Wren	0	-	-	0	-	-	1	-	-	17	-	-	0	-	-	0	-	-
Upland Sandpiper	7	-	-	14	-	-	0	-	-	7	-	-	0	-	-	3	-	-
Grassland Obligate Guild	1067	134	0.08	1601	86	0.06	1107	87	0.09	2596	135	0.05	2127	121	0.05	2454	88	0.05

Notes:

The Golden Grasslands Conservation Opportunity Area showed similar trends to other regions, with a slight decrease in grassland bird densities overall in 2019. Bird populations in this COA have remained relatively consistent since 2014 with a few exceptions. Henslow's Sparrow numbers vary significantly; this may be a function of which properties are sampled in a given year. Similar to most other regions where private lands are a small part of the survey sample, Grasshopper Sparrow density has declined over the years. Northern Bobwhite, Field Sparrow and Dickcissel densities have exhibited slight fluctuations but remain largely steady.

Helton Prairie Conservation Opportunity Area

	2014			2015			2016			2018		
	1 property sampled			1 property sampled			1 property sampled			1 property sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	2	-	-	2	-	-	8	-	-	14	-	-
Bobolink	0	-	-	0	-	-	0	-	-	0	-	-
Dickcissel	33	27	0.44	27	19	0.25	32	18	0.32	56	32	0.38
Eastern Meadowlark	3	-	-	4	-	-	8	-	-	8	-	-
Field Sparrow	30	22	0.25	28	23	0.26	47	29	0.17	45	21	0.29
Grasshopper Sparrow	2	-	-	8	-	-	13	-	-	15	-	-
Henslow's Sparrow	3	-	-	0	-	-	0	-	-	0	-	-
Northern Bobwhite	6	-	-	13	-	-	22	9	0.24	9	-	-
Grassland Obligate Guild	79	55	0.25	82	52	0.12	127	75	0.2	147	84	0.23

Liberal Prairie Conservation Opportunity Area

	2014			2016			2018		
	5 properties sampled			10 properties sampled			13 properties sampled		
	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	191	12	0.11	369	17	0.1	425	17	0.07
Common Nighthawk	3	-	-	1	-	-	3	-	-
Dickcissel	1030	67	0.05	1733	67	0.06	2261	81	0.04
Eastern Meadowlark	155	7	0.1	283	9	0.09	310	8	0.08
Field Sparrow	82	5	0.16	179	8	0.11	269	8	0.08
Grasshopper Sparrow	11	-	-	20	0.7	0.43	2	-	-
Henslow's Sparrow	110	8	0.2	190	7	0.19	321	13	0.12
Northern Bobwhite	65	2	0.15	166	5	0.1	178	3	0.13
Sedge Wren	5	-	-	2	-	-	10	-	-
Upland Sandpiper	1	-	-	0	-	-	0	-	-
Grassland Obligate Guild	1656	91	0.04	3094	123	0.05	3778	132	0.04

Notes:

Helton Prairie Conservation Area represents the only sample in its COA, and the overall increases in grassland bird populations suggest a positive response to significant woody control and ongoing management at the site.

Liberal Prairie COA shows a heartening positive trend in the numbers and density of grassland birds. As in most areas, Grasshopper Sparrow remains scarce on public land. Other grassland obligate populations are remaining steady or increasing.

Prairie Forks Conservation Opportunity Area

Notes:

Prairie Fork Conservation Area represents the only site sampled within this COA. While for most species sample sizes are too low to estimate density, there was a slight increase in overall grassland bird numbers in 2018 as compared to 2016.

Sites outside of Missouri's prioritized regions typically consist of private or NGO lands. Grasshopper Sparrow is more commonly found at these sites than on public lands, while other species show trends similar to the public lands within PGs and COAs. Overall, grassland obligate bird densities are lower on sites outside of designated PGs and COAs.

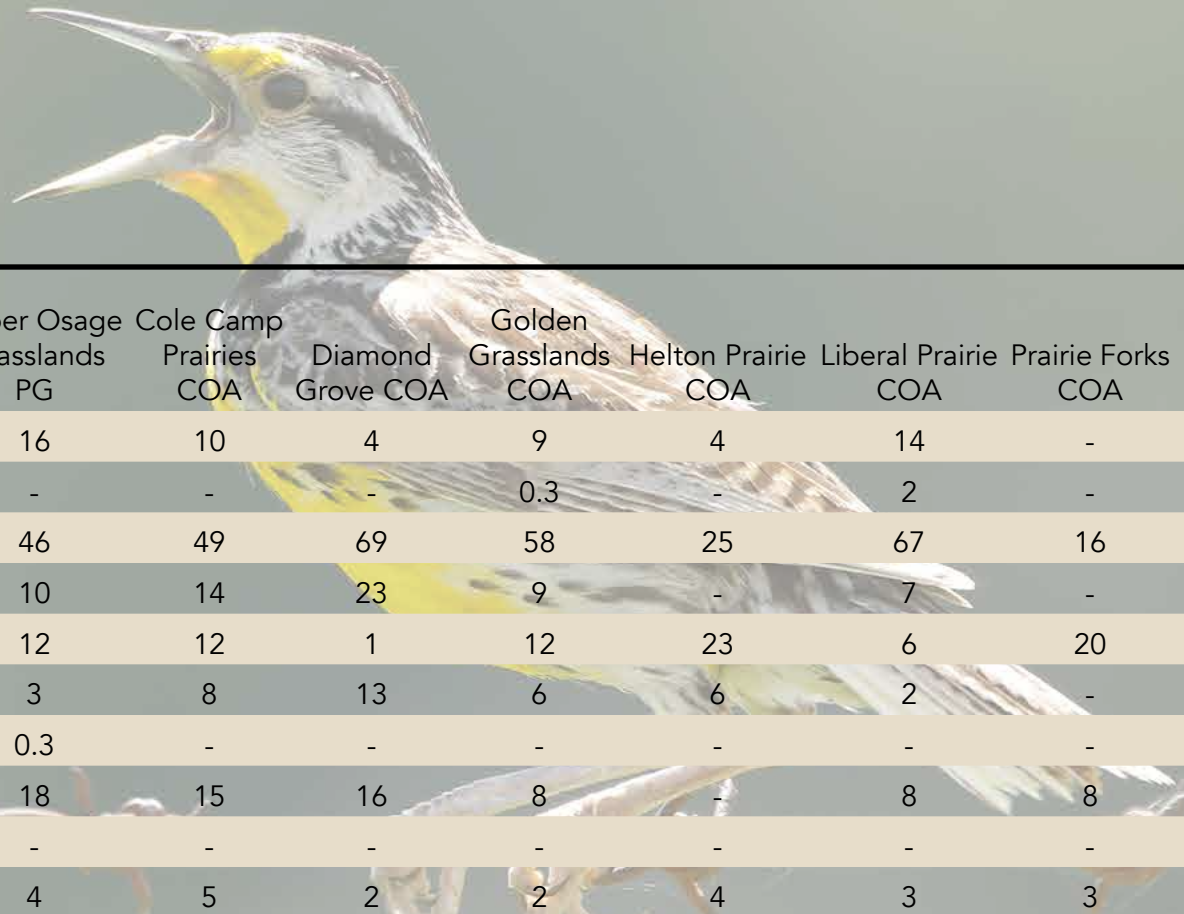
Photo by Linda Williams

	2013			2016			2018		
	1 property sampled			1 property sampled			1 property sampled		
	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	2	-	-	0	-	-	2	-	-
Dickcissel	27	27	0.34	6	-	-	30	20	0.23
Eastern Meadowlark	5	-	-	5	-	-	0	-	-
Field Sparrow	27	29	0.29	30	21	0.3	27	15	0.26
Grasshopper Sparrow	1	-	-	0	-	-	2	-	-
Henslow's Sparrow	18	-	-	11	-	-	4	-	-
Northern Bobwhite	1	-	-	8	-	-	13	-	-
Sedge Wren	2	-	-	0	-	-	0	-	-
Grassland Obligate Guild	83	78	0.21	60	39	0.18	78	50	0.14

Sites Outside of Priority Geographies and Conservation Opportunity Areas

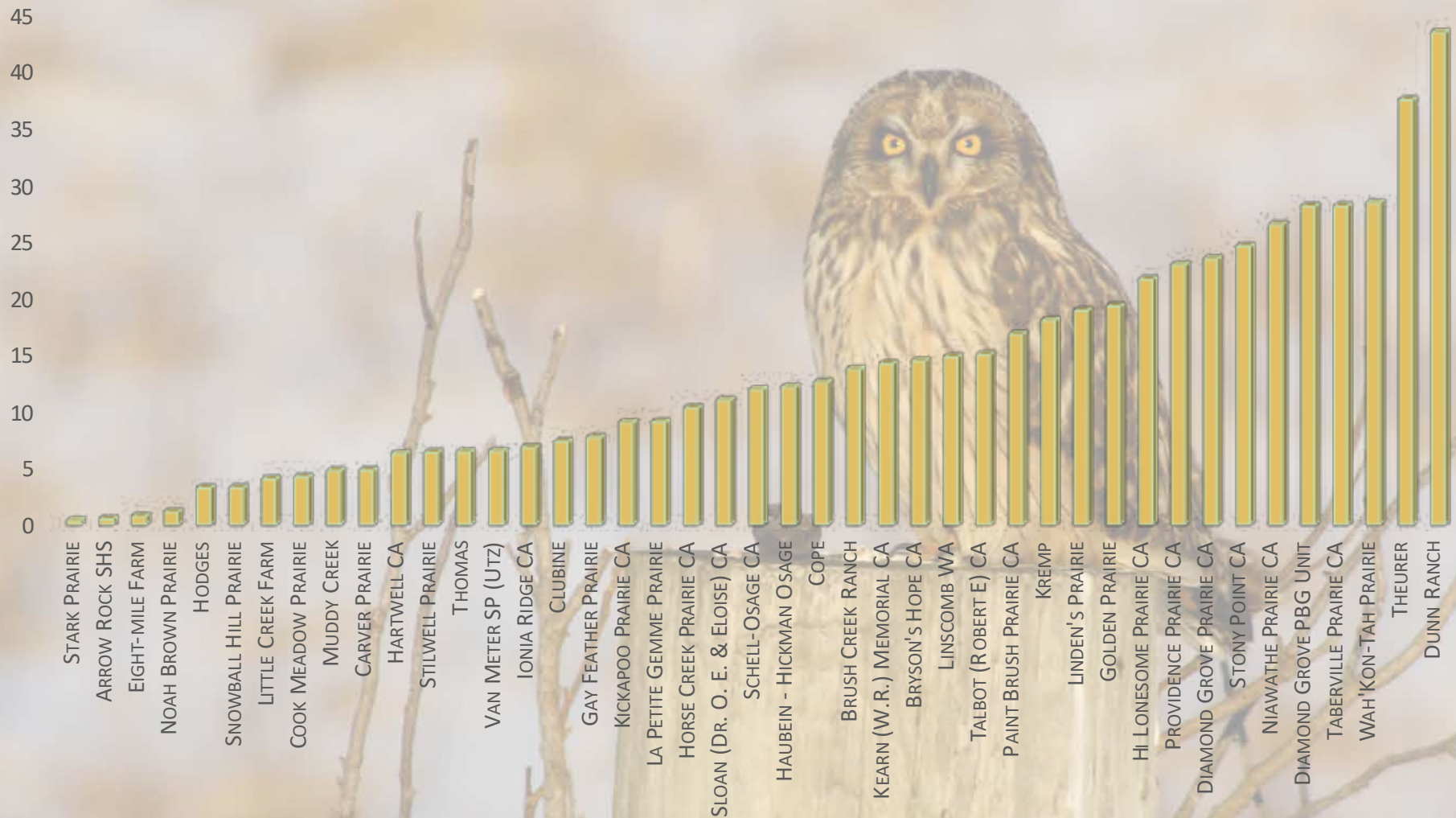
	2014			2015			2016			2017			2018			2019		
	3 properties sampled			1 property sampled			1 property sampled			3 properties sampled			6 properties sampled			10 properties sampled		
	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV	N	D	CV
Bell's Vireo	1	-	-	0	-	-	0	-	-	5	-	-	14	-	-	22	2	0.27
Common Nighthawk	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	1	-	-
Dickcissel	117	38	0.15	49	52	0.28	20	11	0.28	100	45	0.14	236	32	0.11	356	34	0.09
Eastern Meadowlark	38	8	0.23	23	19	0.23	38	17	0.26	26	9	0.27	114	10	0.17	133	9	0.17
Field Sparrow	52	15	0.23	5	-	-	11	-	-	16	-	-	63	7	0.14	87	8	0.15
Grasshopper Sparrow	59	16	0.29	4	-	-	21	10	0.29	3	-	-	90	13	0.21	59	4	0.24
Henslow's Sparrow	26	9	0.46	13	-	-	1	-	-	13	-	-	37	6	0.45	8	-	-
Loggerhead Shrike	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	5	-	-
Northern Bobwhite	11	-	-	6	-	-	4	-	-	15	-	-	34	2	0.25	29	2	0.24
Sedge Wren	0	-	-	2	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Upland Sandpiper	0	-	-	0	-	-	0	-	-	0	-	-	2	-	-	1	-	-
Grassland Obligate Guild	352	97	0.09	100	93	0.14	167	81	0.22	178	85	0.13	626	81	0.09	703	63	0.05

Grassland Bird Densities by Geography 2014-2019



	Grand River Grasslands PG	Upper Osage Grasslands PG	Cole Camp Prairies COA	Diamond Grove COA	Golden Grasslands COA	Helton Prairie COA	Liberal Prairie COA	Prairie Forks COA	Outside of PG or COA
Bell's Vireo	1	16	10	4	9	4	14	-	2
Bobolink	43	-	-	-	0.3	-	2	-	8
Dickcissel	39	46	49	69	58	25	67	16	36
Eastern Meadowlark	11	10	14	23	9	-	7	-	10
Field Sparrow	4	12	12	1	12	23	6	20	9
Grasshopper Sparrow	20	3	8	13	6	6	2	-	9
Greater Prairie-Chicken	0.3	0.3	-	-	-	-	-	-	-
Henslow's Sparrow	12	18	15	16	8	-	8	8	4
Loggerhead Shrike	-	-	-	-	-	-	-	-	-
Northern Bobwhite	3	4	5	2	2	4	3	3	2
Sedge Wren	6	-	-	-	-	-	-	-	-
Upland Sandpiper	2	-	1	-	0.2	-	-	-	-
Grassland Obligate Guild	126	102	109	123	97	62	98	48	75

Bird-Friendliness Scores of all Missouri Properties Surveyed in 2019



Bird-friendliness Scores were originally designed to measure the management progress of ranches enrolled in the Audubon Conservation Ranching initiative. We have subsequently applied them to all properties surveyed in a year in order to provide an additional measure of habitat quality. The Score is calculated by multiplying the **density (D)** of each grassland obligate species by its **Missouri Conservation Value** - this value has been established by State Ornithologist Sarah Kendrick's Missouri Bird Plan working group. The resulting number is then further multiplied by the property's **Brillouin Index** to take into account species richness and evenness. By considering the Conservation Value and density of species present (as opposed to abundance or sample size) along with a diversity measure, the Bird-friendliness Scoring system attempts to fairly minimize the effects of significantly different acreages. Nevertheless, as depicted here, very small properties often do not afford a large enough avian sample size to estimate densities; therefore a small property's score may consist only of its Brillouin Index. Additionally, properties in northern Missouri have the benefit of being located in the typical geographic ranges of Bobolink and Upland Sandpiper. For survey sites where sample sizes are adequate, the Bird-friendliness Score provides an illustrative picture of avian response to habitat quality.

