PRAIRIE CHICKEN LEK SURVEY - 2013

PERFORMANCE REPORT
STATEWIDE WILDLIFE RESEARCH AND SURVEYS

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INTRODUCTION

The spring prairie chicken lek survey was first initiated in Kansas in 1963 with the creation of 9 survey routes within the range of the greater prairie-chicken (GPCH). Lesser prairie-chickens (LPCH) were first surveyed in 1967 when 3 survey routes were created in southwestern Kansas. These initial routes were not adequately distributed across the current occupied range of either species. Over the years, the Kansas Department of Wildlife, Parks, & Tourism (KDWPT) has tried to rectify that problem by adding several new survey routes including two new ones as recently as 2012 (Logan and Graham Counties). The KDWPT now annually surveys 50 routes spread across the state including 33 within the range of the GPCH, 14 within the range of the LPCH, and 3 within the area where the two species ranges overlap (Table 1, Figure 1). The survey area associated with these routes covers 661.7 $mi.^2$ within Kansas' GPCH range, 262.3 $mi.^2$ within Kansas' LPCH range, and 62.8 $mi.^2$ within the area where occupied ranges of the two species overlap.

METHODS

Observers traversed each survey route twice between March 20 and April 20 starting at 30 minutes before sunrise (Figure 2). They listened for booming prairie chickens for 3 minutes at established stops placed at approximately 1 mile intervals. After all of the listening stops had been completed, the observers backtracked along the route and flushed all the lek sites that they identified up through 90 minutes after sunrise. Observers recorded the geographic coordinates of each lek they located and the total number of birds flushed from each site (Figure 3). Observers were instructed to get two flush counts from each lek they identify within their standard survey area which included all habitats within approximately 1 mile of the survey route. To get all the required flush counts, it often took additional efforts beyond the two mornings when the listening stops were completed.

Flush counts collected from within each survey area were used to develop density indices for each route. The maximum counts for all leks within each survey area were summed and multiplied by two to represent the total number of birds in the survey area. Those figures were divided by the number of square miles surveyed along each route to produce an estimate of the total number of birds per square mile. This method of estimating density assumes 1.) only males are counted, 2.) all males attend leks, 3.) the sex ratio is equal, and 4.) all leks within the survey area are detected. It is likely that some of these assumptions are being violated and as a result the density estimates are probably biased (most likely low). It is assumed that the direction and degree of bias is fairly consistent across years and that the indices correlate with real changes in population abundance. However, there was no measure of variability associated with the route-specific indices so statistical tests could not be used to determine if annual changes were significant at that scale.

Data collected along all routes surveyed in consecutive years by the same observer were also used to estimate changes in abundance within each management region as well as species-specific changes in abundance across the entire state. Density estimates for all routes within each small game region (Figure 1) were weighted by the survey area associated with each route and averaged to produce regional indices. The statewide species-specific indices were developed using a similar weighted average procedure and were developed from density estimates derived for all routes located within the estimated occupied range (EOR) of each species. Three routes fall within the area where the GPCH and LPCH ranges overlap and data from those routes were incorporated into the density estimates for each species. Statistical tests can be used to identify significant annual changes at the regional level because there is cross-route variability in density indices. A one-tailed paired t-test that assumed equal variance was used to identify significant annual changes within each region and across the entire range of each species (Ott 1993). Indices were considered to differ significantly when $P<0.05$.

Long-term trends were developed for each small game management region. Annual indices used to develop each trend were only calculated for years in which density indices were available for all of the selected routes. This was done to ensure that the trend was based on indices developed for identical survey areas. The time period for which a trend can be developed differs across regions due to data availability. Due to a poor distribution of survey effort across the occupied ranges of each species,

statewide trends could only be developed for LPCH and GPCH from 2004 and 2011, respectively. Linear regression was used to determine if the slope of each fitted trend line differed from zero (Ott 1993).

The estimated density within only occupied habitats was calculated for LPCH by dividing the route-specific indices by the proportion of each survey area classified as having a probability of lek occurrence ≥0.3 (Jarnevich and Laubhan 2011). This threshold encompasses >80% of the LPCH lek sites that were known to be active from 2005-2011. Density within occupied habitats was only estimated for LPCH because suitable GPCH habitat has not been quantitatively identified across the entire state.

RESULTS

Observers attempted to survey all 50 routes during spring 2013 but data collection was incomplete along one of those routes (Logan County). During the 2013 survey, observers recorded maximum flush counts of 112 birds from 20 leks along the 14 routes (262.3 mi.^{2}) that were completed within LPCH range, 1,089 birds from 90 leks along the 32 routes (661.7 mi.^{2}) that were completed within GPCH range, and 156 birds from 17 leks along the 3 routes (62.8 mi.^{2}) that were surveyed within the area where the two species ranges overlap (not all of the detected leks were flushed).

Statewide LPCH Indices and Trend

The statewide LPCH index was calculated using data from 13 routes that were fairly well distributed across the EOR of the species in Kansas. The weighted density indices (birds/mi.^{2}) across the entire 239.1 mi.^{2} surveyed in both 2012 and 2013 by the same observer were 2.15 and 1.65, respectively (Table 2). However, the apparent annual decline of 23.2% in the density index was not statistically significant. Since 2004 there has been a significant declining trend in the LPCH index ($P<0.05$; Figure 4a) but the negative slope is mostly due to recent declines associated with severe drought conditions (not habitat loss). A longer time series of data are available for estimation of most regional trends and those data sets reveal quite a bit of variation in population trajectories between the management regions.

Statewide GPCH Indices

The statewide GPCH index was calculated using data from 27 routes that were fairly well distributed across the EOR of the species in Kansas. The weighted density indices (birds/mi.^{2}) across the entire 541.1 mi.^{2} surveyed in both 2012 and 2013 by the same observer were 5.07 and 4.02, respectively (Table 2). These density indices did not differ significantly ($P>0.05$) but they did indicate an apparent decline of 20.7% from the previous year. Unfortunately, a statewide trend for GPCH can only be developed for the last 3 years due to an inadequate distribution of sampling effort prior to 2011. The trend over the last 3 years has been declining but it is not statistically significant (Figure 4b). The short-term decline in the statewide index corresponds with a period when most of the GPCH range was affected by severe drought.

Regional Indices and Estimates

There were apparent declines in the prairie chicken breeding density index from the previous year within every management region but not of them were statistically significant (Table 2). However, substantial apparent declines were observed in the Northern High Plains (-42.0%), Osage Cuestas (-39.7%), Southern High Plains (-35.3%), and Smoky Hills (-24.0%). The population indices declined in relatively small amounts from the previous year in the Flint Hills (-9.1%) and South-Central Prairies (-2.7%). The observed regional declines were most likely due to poor production during the summer of 2012 across most of the state due continuation of one of the worst droughts on record.

Linear regression indicates no detectable trend in prairie chicken populations in the Northern High Plains since 2004 (Both Species), the South-Central Prairies (LPCH) since 1991, and the Smoky Hills (GPCH) since 1986 (Figure 5). Only GPCH occurred along the 7 routes that were included in the development of the Smoky Hills trend. LPCH do occur in the western portion of the Smoky Hills region but no routes were established in those habitats until 2006 (Table 1). Significant population declines have occurred for GPCH in the Flint Hills region and the Osage Cuestas region since 1978 and 1966, respectively. Additionally, the LPCH population in the Southern High Plains region has also declined significantly since 1988.

Mean lek size during spring 2013 was greatest within the Flint Hills at 12.4 birds per lek and least in the Southern High Plains region at 6.0 birds per lek (Table 3). Species-specific estimates were greatest in the Smoky Hills for GPCH (13.1 birds/lek) and the Northern High Plains for LPCH (8.5 birds/lek). Both species of prairie chicken were known to occur along survey routes located in Gove, Ness, and Logan Counties. Since 2006, observers in Gove and Ness Counties have attempted to quantify the number of GPCH, LPCH, and hybrids on each lek by sight and/or vocalizations. Similarly, species-specific counts are attempted along the Logan County survey route which was added in 2012. The spring 2013 data indicated that prairie chicken populations within the Gove, Ness, and Logan County survey areas were dominated by LPCH (>85%, Table 4). Species-specific counts along the Rooks County route were also tabulated due to the fact that 1 GPCH x LPCH hybrid was observed on a lek in that area in 2012. However, no hybrids or LPCH were observed within that survey area in 2013. The pooled percentage of GPCH x LPCH hybrids across all 4 routes was 3.0% during spring 2013. Since 2006, the percentage of birds classified as hybrids in the area where their ranges were known to overlap has been <5% each year (Rodgers 2006-2010, Pitman 2011-2012) and no apparent trend is evident.

LPCH Density Estimates within only Potentially Suitable Habitats

Route-specific densities of LPCH calculated for only potentially suitable habitat indicate that occupied habitats at the northern and eastern portions of the EOR supported much higher densities than elsewhere in the state during 2013 (Table 5). The highest densities of LPCH were estimated for suitable habitats north of the Arkansas River where >10 birds/mi.^{2} were documented within potentially suitable habitats along 3 routes. The species was thought to have been extirpated from north of the Arkansas River since the 1960s until the KDWPT began documenting lek sites in the area again in the late 1990s and early 2000s. The resurgence of LPCH in that portion of the state was most likely a result of increasing native habitats due to targeted enrollments of conservation reserve program (CRP) grasslands. The CRP provides roughly 1 million acres of habitat for the species within the current EOR north of the Arkansas River.

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Table 1. Survey routes annually monitored by the Kansas Department of Wildlife, Parks, and Tourism to estimate changes in prairie chicken abundance.

Route	County or Location	Year Established	Species	Management Region	2013 Observer
1	Allen	1963	GPCH[a]	Osage Cuestas	Ben Womelsdorf (LE)
2	Anderson	1963	GPCH	Osage Cuestas	Justin Harbit
3	Barber	2000	LPCH[b]	South Central Prairies	Ken Brunson (TNC)
4	Butler	1963	GPCH	Flint Hills	Charlie Cope
5	Chase	1963	GPCH	Flint Hills	Jeff Rue[*]
6	Chautauqua	1983	GPCH	Flint Hills	Darin Porter
7	Clark	1966	LPCH	South Central Prairies	Tanner Dixson (LE)[*]
8	Clay	1978	GPCH	Flint Hills	Clint Thornton
9	Cloud	1984	GPCH	Smoky Hills	Todd Robinson (LE)
10	Coffee	1966	GPCH	Osage Cuestas	Bob Culbertson
11	Comanche	1991	LPCH	South Central Prairies	Charlie Swank
12	Cowley	1984	GPCH	Flint Hills	Kurt Grimm
13	Dickinson	1983	GPCH	Flint Hills	Shane Hesting
14	Elk	1982	GPCH	Flint Hills	Ryan Good[*]
15	Ellsworth	1979	GPCH	Smoky Hills	Matt Smith
16	Finney	1964	LPCH	Southern High Plains	Daryl Fisher
17	Ford	1988	LPCH	Southern High Plains	Lowell Aberson
18	Geary	1982	GPCH	Flint Hills	Jesse Gehrt
19	Gove	2004	Both	Northern High Plains	Matt Bain (TNC)
20	Greenwood	1963	GPCH	Flint Hills	John Johnson[*]
21	Hamilton	1979	LPCH	Southern High Plains	Randy Rodgers (retired)
22	Hodgeman	2001	LPCH	Smoky Hills	Brent Clark[*]
23	Kearny	1978	LPCH	Southern High Plains	Jon Heistand[*]
24	Kiowa	2001	LPCH	South Central Prairies	Chris Berens
25	Lincoln	1983	GPCH	Smoky Hills	Vickie Cikanek[*]
26	Lyon	1963	GPCH	Flint Hills	Jim Pitman
27	Marion	1969	GPCH	Flint Hills	Marvin Peterson
28	McPherson	2004	GPCH	Smoky Hills	Steve Adams
29	Meade	1964	LPCH	Southern High Plains	Jon Zuercher
30	Mitchell	1978	GPCH	Smoky Hills	Aaron Deters
31	Montgomery	1982	GPCH	Osage Cuestas	Ed Miller
32	Morris	1963	GPCH	Flint Hills	Lloyd Fox
33	Morton	1964	LPCH	Southern High Plains	Kraig Schultz
34	Ness	2006	Both	Smoky Hills	Aaron Baugh
35	Osage	1963	GPCH	Osage Cuestas	Matt Peek
36	Ottawa	1982	GPCH	Smoky Hills	Pat Riese
37	Phillips	2011	GPCH	Smoky Hills	Marc Gray
38	Pottawatomie	1965	GPCH	Flint Hills	Corey Alderson
39	Pratt Sandhills WA	1980	LPCH	South Central Prairies	Todd Gatton
40	Rooks	2011	GPCH	Smoky Hills	Dave Dahlgren
41	Saline	1982	GPCH	Smoky Hills	Shane Hesting
42	Sandsage BR	1977	LPCH	Southern High Plains	Tom Norman
43	Sherman - Cheyenne	2011	GPCH	Northern High Plains	Wes Sowards[*]
44	Wabaunsee	1963	GPCH	Flint Hills	Brad Rueschhoff
45	Washington	1983	GPCH	Smoky Hills	Megan Smith[*]
46	Wheatland	2007	LPCH	Southern High Plains	Mark Sexson (retired)
47	Wilson	1983	GPCH	Osage Cuestas	Ross Uhrmacher (LE)[*]
48	Woodson	1964	GPCH	Osage Cuestas	Jeff Prendergast
49	Graham	2012	GPCH	Northern High Plains	Tony Ifland (USFWS)
50	Logan	2012	Both	Northern High Plains	Mark Witecha (PF)

[a] GPCH = greater prairie-chicken

[b] LPCH = lesser prairie-chicken

[c] different observer from 2012

Table 2. Density estimates for greater prairie-chickens (GPCH) and lesser prairie-chickens (LPCH) within areas surveyed by the Kansas Department of Wildlife, Parks, & Tourism, 2013.

Region-route	Species	Total Survey Area ($mi.^2$)	Unique Leks Observed within Survey Area, 2013	Sum of Max Counts, 2013	2013 Density ($birds/mi.^2$)[a]	2012 Density ($birds/mi.^2$)[a]	Apparent Change (%) from 2012[b]
Flint Hills							
4 Butler	GPCH	19.9	8	84	8.44	13.47	-37.3%
5 Chase[d]	GPCH	20	3	19	1.90	2.50	-24.0%
6 Chautauqua	GPCH	20.1	0	0	0.00	0.00	NA[a]
8 Clay	GPCH	18.9	2	24	2.54	3.49	-27.2%
12 Cowley	GPCH	19.9	5	55	5.53	5.03	+9.9%
13 Dickinson	GPCH	19.8	2	22	2.22	3.23	-31.3%
14 Elk[d]	GPCH	19.9	0	0	0.00	0.00	NA
18 Geary	GPCH	20	3	48	4.80	2.60	+84.6%
20 Greenwood[d]	GPCH	19.9	3	19	1.91	0.40	+377.5%
26 Lyon	GPCH	19.6	4	84	8.57	9.59	-10.6%
27 Marion	GPCH	20	3	26	2.60	2.80	-7.1%
32 Morris	GPCH	20.4	3	30	2.94	3.63	-19.0%
38 Pottowatomie	GPCH	19.9	4	31	3.12	4.32	-27.8%
44 Wabaunsee	GPCH	20	6	128	12.80	10.80	+18.5%
Regionwide (n = 11)[e]	*GPCH*	*218.5*	*40*	*532*	*4.87*	*5.35*	*-9.1%*
Northern High Plains							
19 Gove	Both	19.6	8	87	8.88	12.04	-26.2%
43 Sherman-Cheyenne[d]	GPCH	19.8	1	18	1.82	1.52	+19.7%
49 Graham	GPCH	24.0	5	25	2.08	6.25	-66.7%
50 Logan[d,f]	Both	24.0	4	25	NE	NE	NA
Regionwide (n = 2)[e]	*Both*	*43.6*	*13*	*112*	*5.14*	*8.85*	*-42.0%*
Osage Cuestas							
1 Allen	GPCH	20.1	0	0	0.00	0.00	NA
2 Anderson	GPCH	20.2	1	6	0.59	2.67	-77.9%

Region-route	Species	Total Survey Area (mi.^{2})	Unique Leks Observed within Survey Area, 2013	Sum of Max Counts, 2013	2013 Density (birds/mi.^{2})[a]	2012 Density (birds/mi.^{2})[a]	Apparent Change (%) from 2012[b]
10 Coffey	GPCH	20.1	0	0	0.00	0.00	NA
31 Montgomery	GPCH	20	0	0	0.00	NE	NA
35 Osage	GPCH	19.8	1	14	1.41	1.82	-22.5%
47 Wilson[d]	GPCH	20.1	0	0	0.00	0.00	NA
48 Woodson	GPCH	20.1	2	9	0.90	0.30	+200.0%
Regionwide (n = 5)[e]	*GPCH*	*100.3*	*4*	*29*	*0.58*	*0.96*	*-39.7%*
Smoky Hills							
9 Cloud	GPCH	20.1	4	72	7.16	7.06	+1.4%
15 Ellsworth	GPCH	20.1	2	31	3.08	3.08	0.0
22 Hodgeman[d]	LPCH	20	6	38	3.80	2.90	+31.0%
25 Lincoln[d]	GPCH	19.7	3	34	3.45	3.55	-2.8%
28 McPherson	GPCH	20.1	4	65	6.47	7.66	-15.5%
30 Mitchell	GPCH	19.2	3	50	5.21	9.06	-42.5%
34 Ness	Both	19.2	5	44	4.58	5.73	-20.1%
36 Ottawa	GPCH	20	5	47	4.70	4.50	+4.4%
37 Phillips	GPCH	20	2	18	1.80	5.90	-69.5%
40 Rooks	GPCH	19.8	8	80	8.08	10.81	-25.3%
41 Saline	GPCH	20.2	1	7	0.69	1.29	-46.5%
45 Washington[d]	GPCH	20.1	2	43	4.28	6.67	-35.8%
Regionwide (n = 9)[e]	*Both*[h]	*178.7*	*34*	*414*	*4.63*	*6.10*	*-24.0%*
South Central Prairies							
3 Barber	LPCH	18.7	0	0	0.00	0.00	NA
7 Clark[d]	LPCH	20	2	7	0.70	1.40	-50.0%
11 Comanche	LPCH	19.8	1	7	0.71	2.12	-66.5%
24 Kiowa	LPCH	19.8	3	29	2.93	1.62	+80.9%
39 Pratt Sandhills WA	LPCH	13.4	0	0	0.00	0.00	NA
Regionwide (n = 4)[e]	*LPCH*	*71.7*	*4*	*36*	*1.01*	*1.03*	*-2.7%*

Region-route	Species	Total Survey Area (mi.^{2})	Unique Leks Observed within Survey Area, 2013	Sum of Max Counts, 2013	2013 Density (birds/mi.^{2})[a]	2012 Density (birds/mi.^{2})[a]	Apparent Change (%) from 2012[b]
Southern High Plains							
16 Finney	LPCH	18.4	0	0	0.00	0.54	-100.0%
17 Ford[d]	LPCH	21.5	0	0	0.00	0.00	NA
21 Hamilton	LPCH	19.8	1	9	0.91	1.41	-35.5%
23 Kearny	LPCH	20.5	0	0	0.00	0.00	NA
29 Meade	LPCH	19.5	3	19	1.95	2.15	-9.3%
33 Morton	LPCH	19.8	1	3	0.30	0.81	-63.0%
42 Sandsage Bison Refuge	LPCH	5.5	0	0	0.00	0.00	NA
46 Wheatland Restoration	LPCH	25.6	0	0	0.00	0.00	NA
Regionwide (n = 7)[e]	*LPCH*	*129.1*	*5*	*31*	*0.48*	*0.74*	*-35.3%*
All GPCH Routes (n = 27)[i]	***GPCH***	**541.1**	**91**	**1,087**	**4.02**	**5.07**	**-20.7%**
All LPCH Routes (n = 13)[i]	***LPCH***	**239.6**	**22**	**198**	**1.65**	**2.15**	**-23.2%**

[a] When calculating density the assumption is made that half of the population is not observed on lek sites on a given morning (i.e. females and non-displaying males).

[b] Statistical significance can only be assessed for the region-wide and range-wide estimates because there is no measure of variance associated with the estimates for individual routes. Region-wide and range-wide indices that are significantly different ($P < 0.05$) are denoted with an asterisk.

[c] NA = not applicable

[d] Data not used to asses regional population change from previous year because the route was either new, surveyed by a different observer than the previous year, or data collection was incomplete at least one of the years.

[e] Data were pooled across only completed routes that were surveyed in 2012 and 2013 by the same observer. The regional indices were weighted by survey areas.

[f] One lek was not flushed.

[g] NE = no estimate due to incomplete lek counts or no survey effort

[h] Primarily GPCH but LPCH are present along two routes.

[i] Data were pooled across all routes within the estimated occupied range of each species surveyed by the same observer in both 2012 and 2013. Data from the Ness, Gove, and Logan Counties were included in both the LPCH and GPCH range-wide estimates because both species are present within those survey areas.

Table 3. Mean size of leks occupied by greater prairie-chickens (GPCH), lesser prairie-chickens (LPCH), and both species (Mixed) within each of Kansas' small game management regions, 2013. The maximum count observed on each lek was used to develop the regional means. Only leks containing ≥3 birds were included in the calculations.

Region	n	GPCH (95% CI)	n	LPCH (95% CI)	n	Mixed (95% CI)	n	All Leks (95% CI)
Flint Hills	46	12.4 (11.3 – 13.5)	--	--	--	--	46	12.4 (11.3 – 13.5)
Northern High Plains	5	8.6 (5.8 – 11.4)	6	8.5 (6.8 – 10.2)	5	12.2 (10.5 – 13.9)	16	9.7 (7.3 – 12.1)
Osage Cuestas	3	9.7 (6.8 – 12.5)	--	--	--	--	3	9.7 (6.8 – 12.5)
Smoky Hills	34	13.1 (11.8 – 14.5)	9	8.0 (7.1 – 8.9)	2	7.5 (7.0 -8.0)	45	11.9 (9.8 – 14.0)
South Central Prairies	--	--	9	6.9 (5.8 – 8.0)	--	--	9	6.9 (5.8 – 8.0)
Southern High Plains	--	--	2	6.0 (3.0 – 9.0)	--	--	2	6.0 (3.0 – 9.0)
Statewide	88	12.4 (10.8 - 14.0)	26	7.6 (6.3 – 8.9)	7	10.9 (7.9 – 13.8)	121	11.3 (10.1 – 12.6)

Table 4. Estimated number of greater prairie-chickens (GPCH), lesser prairie-chickens (LPCH), and hybrids on all leks (*n*) counted within the Gove, Ness, Logan, and Rooks County survey areas where both species and/or hybrids have been documented in 2013 or previous years. The species-specific estimates from the day when the maximum total count occurred were used for these calculations.

Species	Gove County (*n* = 8)	Ness County (*n* = 5)	Logan (*n* = 3)[a]	Rooks County (n = 8)	All 4 Routes (*n* = 24)
LPCH	81 (94.2%)	41(87.2%)	23 (93.2%)	0 (0.0%)	145 (61.7%)
GPCH	3 (3.5%)	0 (0.0%)	0 (0.0%)	80 (100.0%)	83 (35.3%)
Hybrid	3 (3.5%)	3 (12.8%)	1 (6.8%)	0 (0.0%)	7 (3.0%)

[a] Only 3 of the 4 leks within the survey area was counted.

Table 5. Estimated density of lesser prairie-chickens in potentially suitable habitat within each survey area, 2013.

Routes within LPCH Range	Species	Route Density (birds/mi.^{2})	Proportion of Survey Area Classified as Suitable Habitat[a]	Density (birds/mi.^{2}) within Suitable Habitat
19 Gove	Both	8.88	0.83	10.70
22 Hodgeman	LPCH	3.80	0.35	10.86
34 Ness	Both	4.58	0.45	10.18
3 Barber	LPCH	0.00	0.05	0.00
7 Clark	LPCH	0.70	0.67	1.04
11 Comanche	LPCH	0.71	0.56	1.27
24 Kiowa	LPCH	2.93	0.34	8.62
16 Finney	LPCH	0.00	0.50	0.00
17 Ford	LPCH	0.00	0.09	0.00
21 Hamilton	LPCH	0.91	0.77	1.18
23 Kearny	LPCH	0.00	0.16	0.00
29 Meade	LPCH	1.95	0.88	2.22
33 Morton	LPCH	0.30	0.89	0.34
39 Pratt Sandhills WA	LPCH	0.00	0.37	0.00
42 Sandsage Bison Refuge	LPCH	0.00	0.61	0.00
46 Wheatland Restoration	LPCH	0.00	0.15	0.00
50 Logan	Both	NE	0.22	NE

[a] Identified as areas with a probability of lek occurrence ≥0.3 (Laubhan and Jarnevich 2010).
[b] NE = no estimate

Figure 1. Prairie chicken survey areas monitored annually by the Kansas Department of Wildlife, Parks, and Tourism. The map also depicts the estimated occupied range of each species and Kansas' seven small game management regions.

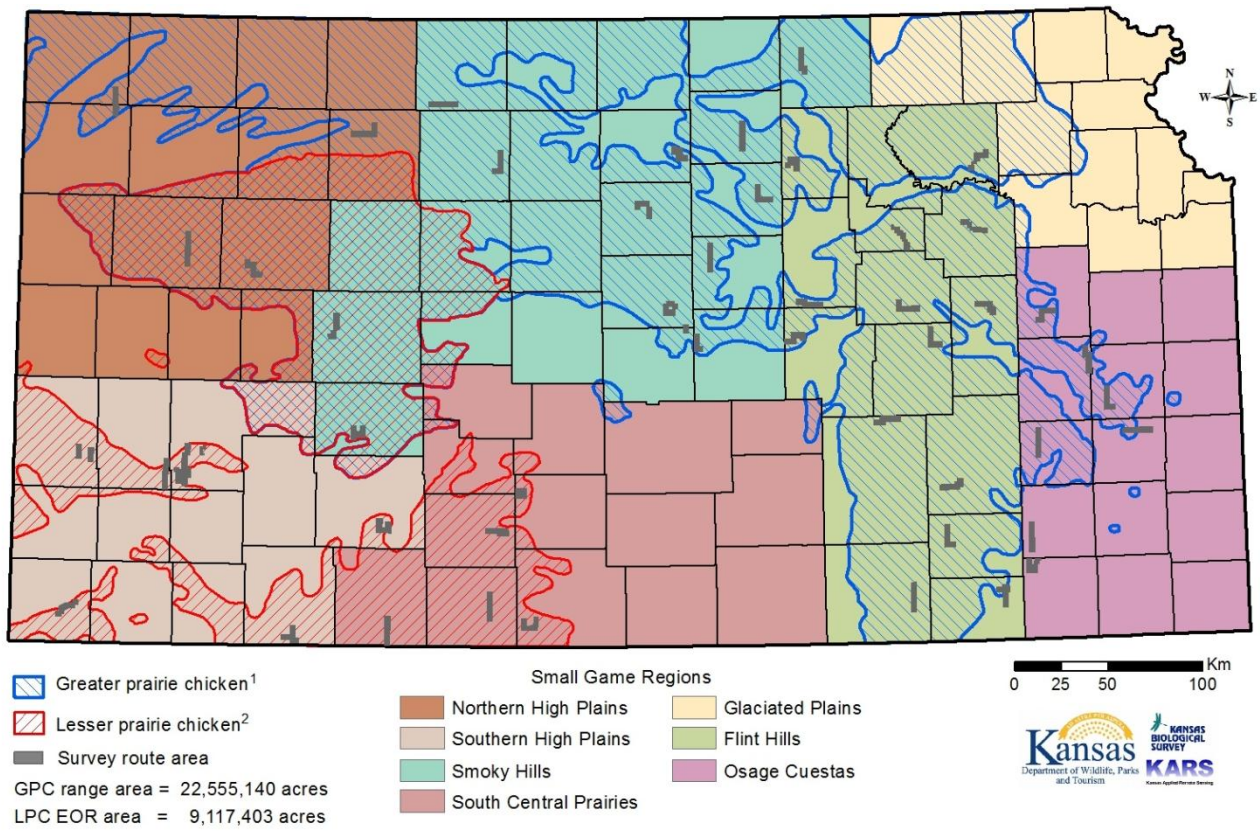


Figure 2. Instructions for conducting one of the annual prairie chicken surveys in Kansas.

1. ***The survey period is March 20th to April 20th***. *Don't put the survey off as the weather may not cooperate later. New observers should familiarize themselves with the starting point, road or trail conditions, and listening stations of their assigned route by driving the route prior to the survey.*

2. *You have been provided with a route map which indicates the location of the listening stops and the one mile buffer along the route that defines the survey area.*

3. *Record the route number and county, date, starting and ending times, time of sunrise, and weather conditions on the survey form.* ***Begin the listening segment 30 minutes before sunrise*** *at station 0 and continue through station 10.*

4. *The full listening survey should not be conducted if it's raining, foggy, or if sustained winds are >12 mph. A few brief gusts exceeding 12 mph are OK, but listening conditions must not be significantly impaired.*

5. *At each station, shut off the engine, get out of the vehicle, and move > 5 yards away.* ***Stand quietly and listen for 3 minutes***.

6. ***Assign each lek that you hear along your route with a unique identifier*** *and record the general proximity on the data sheet. Every lek that you hear should be recorded including those leks that you do not have time to physically locate on the date of the survey.*

7. *Immediately upon completing all the listening stations begin backtracking along your route and locating the leks that you heard within your survey area. When a lek is located, flush the birds from the site, get a count, and record that number onto your data sheet.* ***A lek is defined as 3 or more chickens on a display site***.

8. ***Use your GPS units to collect the location of each lek in decimal degrees using the World Geodetic System 1984 (WGS84) as the datum*** *and record the coordinates onto the data sheet.*

9. *If a lek is found to be >1 mi.from the route the observation should be removed from the primary data table and recorded with the opportunistic observations in the second data table.*

10. ***Do not conduct flush counts later than 90 minutes after sunrise***. *Depending on the number of active leks within your survey area, it may take additional mornings beyond the two required listening surveys to get all the needed flush counts.*

11. ***If possible, flush and count all leks within your survey area twice***. ***Your data can not be used to estimate population trends if you do not get at least one flush count from every lek sometime during the survey period***. *It is acceptable to obtain flush counts on known lek locations when winds are >12 mph but it is not acceptable to run the full route under those conditions (see point 4).*

12. ***Complete 2 full listening runs*** *along each route.*

Figure 3. Data sheet used to collect survey data.

KDWPT PRAIRIE CHICKEN LEK SURVEY DATA SHEET

Route Number: _____ County:_____ Observer:_____

Survey Attempt (1, 2, or 'additional effort'):_____ Date:_____

	Time	Cloud Cover (%)	Temperature (F°)	Wind Speed (mph)
Start				
End				

LEK OBSERVATIONS WITHIN 1 MILE OF ROUTE (area delineated on route maps)

1) **Record all leks that you hear within the survey area during the two complete survey runs even if those leks are not flushed.** This is not required for any additional survey efforts after the two full runs have been completed (i.e. if you are only getting flush counts).
2) Two flush counts are requested for every lek detected within the survey area. **Your data can not be used to estimate population trends unless every lek within the survey area is flushed at least once.**

Unique Identifier (A, B, etc.) Note: code each unique lek with the same identifier on every data sheet	General Location (i.e. ¼ mi. NE of stop 0)	Species (GPCH, LPCH, or Mixed)	Latitude (97.37390°) Note: use decimal degrees and datum WGS84	Longitude (-101.83489°) Note: use decimal degrees and datum WGS84	Flush Count	Comments Note: If the lek is mixed please try to provide the number of each species in the comments (or an approximation)

OPPORTUNISTIC LEK OBSERVATIONS OUTSIDE SURVEY AREA (>1 mi. from route)

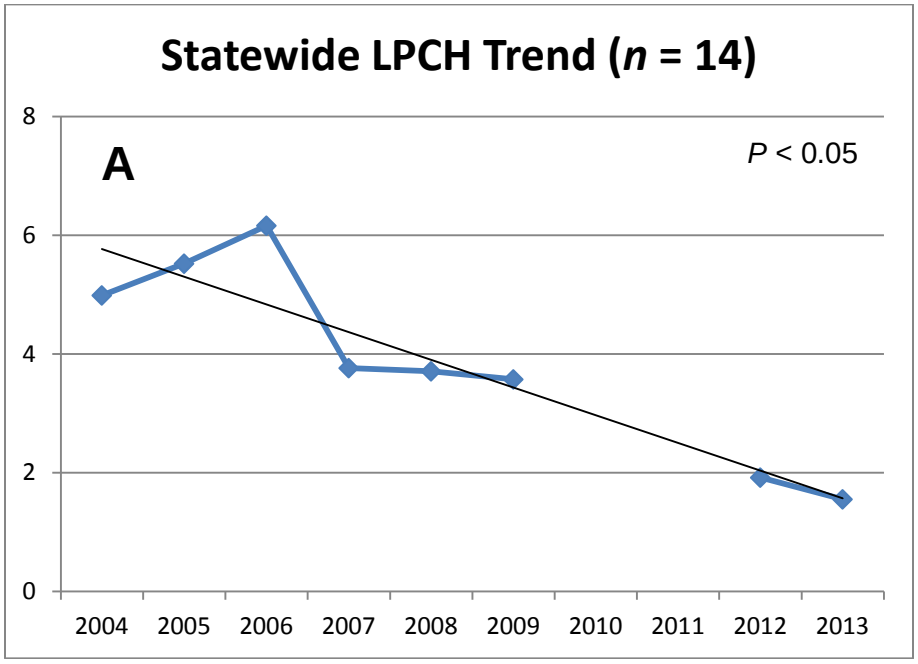
Unique Identifier	General Location (proximity to intersection or PLSS)	Species	Latitude (97.37390°)	Longitude (-101.83489°)	Flush Count	Comments

Observations from table 1 should be entered online at http://www.surveymonkey.com/s/KDWPTleksurvey.
Observations from table 2 should be entered online at https://www.surveymonkey.com/s/chickenleks.

Were observation entered into the online databases? Yes ○ No ◉

Mail completed form to Jim Pitman, KDWPT, PO Box 1525, Emporia, KS 66801 or send via e-mail to jim.pitman@ksoutdoors.com.

Figure 4. The estimated trend in abundance (birds/mi.^{2}) of lesser prairie-chickens (A) and greater prairie-chickens (B) within Kansas' occupied range. Survey effort was not well distributed throughout the current occupied range of lesser and greater prairie-chickens until 2004 and 2011, respectively. For these trend estimates, annual indices were only developed when the full complement of routes was surveyed.



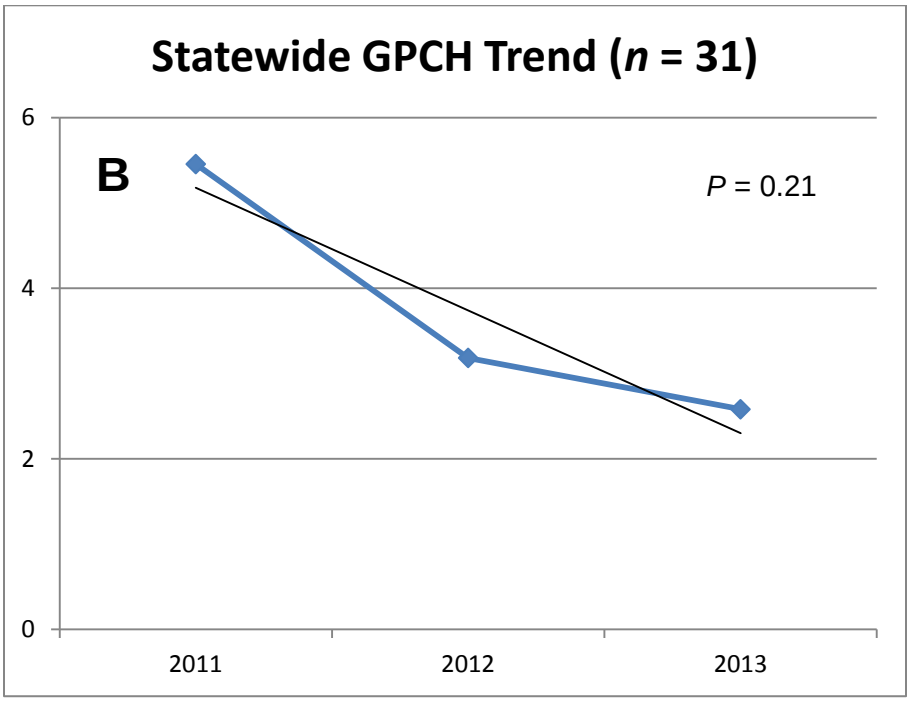


Figure 5. Estimated prairie chicken trends within each of Kansas' small game management regions. The prairie chicken specie(s) and the number of routes summarized by each trend are indicated on each graph. Annual regional indices (birds/ mi. ^{2}) were weighted by the survey area along each route and only calculated when all of the selected routes were surveyed. Note that the years differ along the x-axis of each graph.