

# Distribution and Population Trend of Lesser Prairie-chicken in Kansas

WILLIAM E. JENSEN<sup>1</sup>, DOUGLAS A. ROBINSON, JR.<sup>2</sup>,  
and ROGER D. APPLGATE<sup>3</sup>

Research and Survey Office, Kansas Department of Wildlife  
and Parks, P. O. Box 1525, Emporia, KS 66801-1525 (RDA) and  
Department of Biological Sciences, Box 4050  
Emporia State University (WEJ, DAR, Jr)

**ABSTRACT** -- The lesser prairie-chicken (*Tympanuchus pallidicinctus*) occurs in remnant sand-sagebrush (*Artemisia filifolia*) and grassland dominated prairies of southwestern Kansas. We characterized historical and present distributions of this species in Kansas and analyzed its statewide population trend from 34 years of lek survey data. Lesser prairie-chicken occupies 31 of 39 counties estimated to have been occupied historically. Analysis of population trends indicates the species population in Kansas is declining. Further research and management efforts should address extrinsic factors that may be negatively influencing lesser prairie-chicken in Kansas to prevent the need for candidacy under the Endangered Species Act.

**Key words:** distribution, Kansas, lesser prairie-chicken, population.

The lesser prairie-chicken (*Tympanuchus pallidicinctus*), inhabiting xeric grasslands of southwestern Kansas, southeastern Colorado, western Oklahoma, northern Texas, and eastern New Mexico (Giesen 1998), is restricted to the south-central Great Plains of North America. In Kansas, lesser prairie chicken occurs mainly in sandy, mixed, and shortgrass prairies dominated by sand sagebrush (*Artemisia filifolia*) in the

---

<sup>1</sup>Current address: Kansas Cooperative Fish and Wildlife Research Unit, Division of Biology, Kansas State University, Manhattan, KS 66506-4901.

<sup>2</sup>Current address: Department of Biological Sciences, Binghamton University, Binghamton, NY 13900-6000.

<sup>3</sup>Contact author.

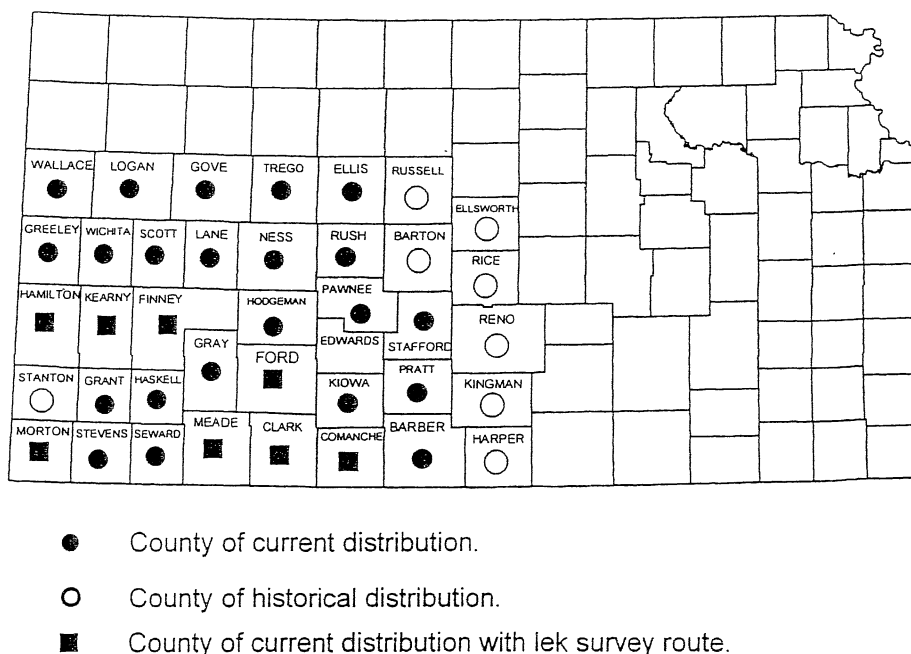
southwestern portion of the state (Horak 1985, Applegate and Riley 1998, M. D. Schwilling, unpubl. report, Kansas Department of Wildlife and Parks). Based on museum specimens and recollections of local landholders, Schwilling (unpubl. report) suggested the species may have historically occupied 39 counties in southwestern Kansas.

The lesser prairie-chicken was petitioned to be listed as threatened under the Endangered Species Act of 1973 (16 U.S.C. 1532 et seq.), however, the listing was found to be warranted but precluded by higher priorities of the United States Fish and Wildlife Service. Intensive agricultural practices have fragmented lesser prairie-chicken breeding habitat and populations, despite the use of cultivated grain fields for forage in winter (Taylor and Guthrie 1980, Giesen 1994a, Applegate and Riley 1998, Giesen 1998, M. D. Schwilling, unpubl. report). Other historical influences on this species in Kansas have been intensive market hunting and prolonged drought in the 1930's. This drought may have resulted in a population bottleneck since few individuals were suggested to have survived (Horak 1985, M. D. Schwilling, unpubl. report). Although lesser prairie-chicken populations are suggested to be cyclical with the incidence of drought (Jackson and DeArment 1963, Crawford 1980, Horak 1985, Applegate and Riley 1998, Giesen 1998, M. D. Schwilling, unpubl. report), the range-wide population has experienced a 90% overall decline and a considerable contraction in its overall distribution since the 1800's (Crawford 1980, Taylor and Guthrie 1980, Giesen 1998). We present the supposed historical and present distributions of the lesser prairie-chicken in Kansas and the recent trend in its population from roadside lek surveys from 1964 to 1998. Speculations are then given on possible extrinsic factors influencing this species in Kansas.

## METHODS

The present distribution of lesser prairie-chicken in Kansas by county was identified from field reports from 1995 to 1999 and other incidental and systematic records supplied by Kansas Department of Wildlife and Parks (KDWP) personnel. Population trend indices were calculated from surveys of leks by KDWP from 1964 to 1998. All surveys were conducted between 20 March and 20 April. Ten lek-survey routes were established across nine counties, each route being 16.09 km in length. Eleven evenly spaced count locations were designated along each route, where participants listened and scanned for lesser prairie-chicken during 3-minute survey periods at each location. Participants were directed to conduct surveys from 40 min. before to 1.5 hr after sunrise. Historical and new lek locations were recorded on maps and flush counts were conducted to document the number of individuals present at each lek. Gender of individuals flushed was not obtained. We used indices of lek and individual counts per route as observational units in population-trend analyses;

hereafter, we refer to these as lek counts and individual counts, respectively. Since sampling methods were inconsistent among routes, we only used data from those routes sampled in a consistent manner (8 routes, Fig. 1). Lek-count data were only available beginning in 1978. Yearly variations in lek and individual counts were analyzed by using linear regression.



**Figure 1.** Estimated historical and present distributions of lesser prairie-chicken and survey routes used in population analyses in Kansas.

## RESULTS

We found that 31 Kansas counties are presently occupied by lesser prairie-chicken of the original 39 counties estimated to comprise its assumed historical distribution (Fig. 1). Little variation in lek and individual counts was explained by year, but the declining slopes of each were significantly different from zero ( $r^2 = 0.25$ ,  $F = 44.803$ ,  $df = 1,135$ ;  $P < 0.0001$ ; and  $r^2 = 0.18$ ,  $F = 40.495$ ,  $df = 1,184$ ;  $P < 0.0001$ ; respectively) (Fig. 2).

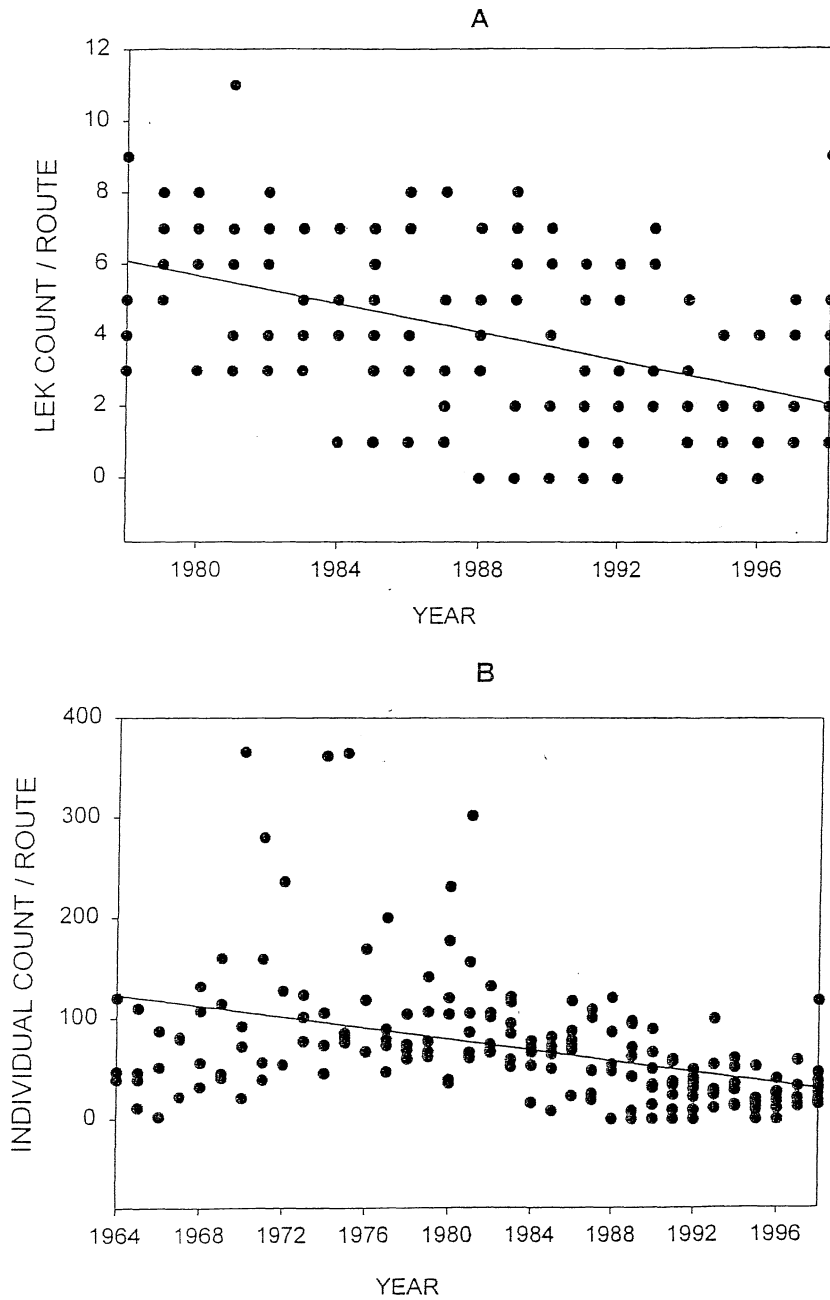
## DISCUSSION

Despite the apparent reduction in the historical geographical distribution of lesser prairie-chicken, the species still occupies a large portion of its estimated former distribution in Kansas. New reports of sightings indicate the species distribution in Kansas may be more widespread than suggested in earlier state reports (White 1963, Waddell 1977). There is even documentation of mixed-species, lesser prairie-chicken and greater prairie-chicken (*Tympanuchus cupido*) leks (KDWP, unpubl. data) where the ranges of the two species overlap.

There appears to be an overall population decline of lesser prairie-chicken in Kansas as indicated from lek and individual count indices. This decline continued despite the lack of severe droughts similar to those in the 1930's. Clearly, there are other factors influencing lek sizes and numbers among routes leading to high variability in these counts within years. Conceivably, this variation may be bolstered by temporarily-increasing local population densities as individuals move into ever-shrinking habitat patches or colonize areas containing large acreages of Conservation Reserve Program. However, the general population trend of the lesser prairie-chicken in Kansas is a declining trend.

Extrinsic, anthropogenic factors likely influence the lesser prairie-chicken population in Kansas. There has been an increase in center-pivot irrigated cropland in southwestern Kansas that has destroyed and fragmented expanses of sagebrush-prairie rangeland (Waddell 1977, KDWP, unpubl. data). In addition to population reduction due to habitat loss, such fragmentation may further reduce the occupancy or suitability of otherwise contiguous habitats (Andren 1997) and influence population dynamics (Wiens 1996). We assume the lesser prairie-chicken population in Kansas is panmictic, but demographic patterns and processes may be uncoupled among subpopulations on isolated grassland fragments that better approximates a metapopulation dynamic. Factors influencing lesser prairie-chicken dispersal among the highly fragmented prairies of southwestern Kansas are not well understood. At the landscape scale, the amount of uncultivated rangeland and shrub habitat remaining in landscapes around leks also has been demonstrated as being relevant to lesser prairie-chicken populations (Crawford and Bolen 1976, Leslie et al. 1999).

Sand sagebrush control may negatively affect lesser prairie-chicken as has been demonstrated with other avifauna in southwestern Kansas (Rodgers and Sexson 1990). Jackson and DeArment (1963) suggested that chemical control of sand sagebrush had deleterious impacts on lesser prairie-chicken breeding habitat. In Colorado, lesser prairie-chicken appears to select nest sites under sand sagebrush plants (Giesen 1994b), and Cannon and Knopf (1981) found that displaying male density was positively related to percent cover of sand sagebrush in Oklahoma. However, in New Mexico, lesser prairie-chicken prefers nesting in association with bunchgrasses (e.g., *Andropogon*



**Figure 2.** Trends of lesser prairie-chicken A) lek and B) individual counts in Kansas, 1964 to 1998. Lek count data are only available since 1978.

spp.)(Riley et al. 1992). These authors found that nesting success of lesser prairie-chicken was greatest when nests were associated with bunchgrasses rather than shrubs. Interactions of grazing intensity and sand sagebrush control may influence nest site selection and nesting success of lesser prairie-chicken (Riley et al. 1992, Giesen 1994b).

The lesser prairie-chicken population in Kansas, although it seemingly occupies a large portion of its former range, appears to be declining throughout its breeding habitat. The possibility exists that the observed lesser prairie-chicken population decline is an artifact of our limited data set of yearly population indices, where the species merely may be in the downward trend of a larger population cycle. However, the lesser prairie-chicken population decline in recent decades is likely due to habitat loss and deterioration. This population may not rebound without appropriate conservation measures such as preservation and restoration of sand-sagebrush prairie. Fragments of grassland with and without extensive sand sagebrush patches exist as potential breeding habitat in southwestern Kansas and should be maintained as a safeguard against further decline. Management efforts for this species recovery need to be based on sound findings from further research on lesser prairie-chicken habitat use, dispersal, and demography in southwestern Kansas.

#### ACKNOWLEDGMENTS

We thank R. D. Rodgers, G. J. Horak, and all other KDWP personnel that did lek surveys, and K. P. Price, T. Hoernemann, J. Kretzer, and C. Wooley for mapping assistance. Our project was funded by KDWP Pittman-Robertson Project W-39-R and predecessors.

#### LITERATURE CITED

- Andren, H. 1997. Habitat fragmentation and changes in biodiversity. *Ecol. Bull.* 46:171-181.
- Applegate, R. D., and T. Z. Riley. 1998. Lesser prairie-chicken management. *Rangelands* 20:13-15.
- Cannon, R. W., and F. L. Knopf. 1981. Lesser prairie chicken densities on shiner oak and sand sagebrush rangelands in Oklahoma. *J. Wildl. Manage.* 45:521-524.
- Crawford, J. A. 1980. Status, problems, and research needs of the lesser prairie chicken. Pp. 1-7 *in* Proceedings Prairie Grouse Symposium. (P. A. Vohs, Jr. and F. L. Knopf, eds.). Oklahoma State Univ., Stillwater, OK.
- Crawford, J. A., and E. G. Bolen. 1976. Effects of land use on lesser prairie chickens in Texas. *J. Wildl. Manage.* 40:96-104.

- Giesen, K. M. 1994a. Breeding range and population status of lesser prairie-chickens in Colorado. *Prairie Nat.* 26:175-182.
- Giesen, K. M. 1994b. Movements and nesting habitat of lesser prairie-chicken hens in Colorado. *Southwest. Nat.* 39:96-98.
- Giesen, K. M. 1998. Lesser prairie-chicken (*Tympanuchus pallidicinctus*). No. 364 in *The birds of North America* (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Horak, G. J. 1985. Kansas prairie chickens. *Kans. Fish and Game Comm., Pratt, KS. Wildl. Bull.* 3.
- Jackson, A. S., and R. DeArment. 1963. The lesser prairie-chicken in the Texas panhandle. *J. Wildl. Manage.* 27:733-737.
- Leslie, D. M., Jr., J. E. Shackford, A. Woodward, S. Fuhlendorf, and C. B. Green. 1999. Landscape-level evaluation of the decline of the lesser prairie-chicken in Oklahoma, Texas and New Mexico. Oklahoma Dept. Wildl. Cons., Oklahoma City, OK. Final Report AP-96-201W.
- Riley, T. Z., C. A. Davis, M. Ortiz, and M. J. Wisdom. 1992. Vegetative characteristics of successful and unsuccessful nests of lesser prairie chickens. *J. Wildl. Manage.* 56:383-387.
- Rodgers, R. D., and M. L. Sexson. 1990. Impacts of extensive chemical control of sand sagebrush on breeding birds. *J. Soil and Water Cons.* 45:494-497.
- Taylor, M. A., and F. S. Guthrie. 1980. Status, ecology, and management of the lesser prairie chicken. USDA Forest Service Gen. Tech. Rep. RM-77.
- Waddell, B. H. 1977. Lesser prairie chicken investigations current status evaluation. Progress Rep., Kans. For., Fish, and Game Comm., Pratt, KS.
- Weins, J. A. 1996. Wildlife in patchy environments: metapopulations, mosaics, and management. Pp. 53-84 in *Metapopulations and wildlife conservation* (D. R. McCullough ed.). Island Press, Washington, D. C.
- White, C. 1963. Distribution of prairie chicken. PR Project W-23-R-1, Kans. For., Fish., and Game Comm., Pratt, KS.