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# **Review of the Historical and Present Status of the Lesser Prairie-chicken (*Tympanuchus pallidicinctus*) in Texas**

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**ABSTRACT** -- Historically, the lesser prairie-chicken (*Tympanuchus pallidicinctus*) occurred in sandy rangeland throughout the northeastern and southwestern (Permian Basin) regions of the Texas Panhandle. Analyses of the historical distribution showed a large reduction in the range of the species in Texas between 1963 and 1980 (78% or 1,070,426 ha), particularly in the southwestern and east-central panhandle, whereas populations in the northeastern Panhandle remained relatively stable. In the northeastern Panhandle, average number of males per lek increased since 1942. In the southwestern Panhandle, average numbers of males per lek decreased dramatically from 1969 to 1981 and from 1985 to 2000, but there was no decline in the northeastern or southwestern panhandle regions from 1990 to 2000. Over the last decade numbers of males per lek in the northeastern Panhandle were 6.6% below the 1942 to 1989 average, but in the southwestern Panhandle they were 54.9% below the 1969 to 1989 average. In the northeastern Panhandle, leks per unit area increased from 1952 to 1986 on the Hemphill County study area and from 1952 to 1974 on the Wheeler County study area. On the Wheeler County study area this variable declined precipitously from 1974 to 1985. The 1997 to 2000 lek per unit area average for the Hemphill County study area was 4.1% above the 1942 to 1986 average, but was 89.5% below the 1997 to 2000 average in the Wheeler County study area. Small expansions, resulting from increased regional conservation efforts, newly established landowner incentive programs, and partnerships between state and federal resource agencies and private landowners, of range occurred in Bailey, Cochran, Gray, Hemphill, Lipscomb, Terry, and Wheeler counties.

**Key words:** conservation, distribution, habitat, lesser prairie-chicken, population, status.

The lesser prairie-chicken (*Tympanuchus pallidicinctus*) formerly occurred in the High Plains region of five states in the Southern Great Plains (Colorado, Kansas, New Mexico, Oklahoma, and Texas) (Bent 1932, Sharpe 1968). However, its geographic distribution has been reduced 92% (Mote et al. 1999), including a 78% decrease in occupied range between 1963 and 1980 (Crawford 1980, Taylor and Guthery 1980). Excessive livestock grazing of rangelands, wide-scale conversion of native prairies and rangeland to cultivation, and decreased habitat quality are major factors that caused the decline in populations of lesser prairie-chicken (Bent 1932, Copelin 1963, Jackson and DeArment 1963, Crawford 1980). Conversion of sand sagebrush (*Artemisia filifolia*) and shinnery oak (*Quercus havardii*) grassland and rangeland continue to fragment areas of suitable habitat. Individual populations within occupied range have become physically separated and risk becoming genetically isolated, thus facilitating the potential for inbreeding depression. Extended droughts during the 1930's, 1950's, and early 1990's also markedly reduced populations of lesser prairie-chicken in the Texas Panhandle.

There is increasing concern about how subtle changes in plant species composition in native prairies may alter availability of critical nesting, brood rearing, and roosting habitat, essential cover, or food, as well as how disease and changes in numbers or composition of predatory species may cause higher mortality rates or lower nesting success (Wiedenfeld et al. 2000). Cumulative effects of these and other unknown factors are particularly relevant in areas of intensive dry-land agriculture and monocultural stands of non-native grasses typical of the Texas Panhandle. Based on declining populations and elimination of critical habitat, the long-term status of the lesser prairie-chicken in the Texas Panhandle is alarmingly reminiscent of the status of the Attwater's prairie-chicken (*T. cupido attwateri*) in south Texas during the 1960's (N. J. Silvy, Texas A & M University, College Station, pers. comm.).

These historical and recent declines in distribution, habitat quality, and population size led to a petition in 1995 to list the lesser prairie-chicken as Threatened under the Federal Endangered Species Act (ESA). In June 1998, the United States Fish and Wildlife Service (USFWS) declared the species to be "warranted but precluded" from listing, and the species remains a candidate for future listing with its status re-evaluated annually (Federal Register 1998).

Our objectives are to: (1) clarify the historical and present geographic distribution of the lesser prairie-chicken in Texas, (2) evaluate and summarize its population status, (3) identify factors hypothesized to have affected reduction of occupied range and declines in populations, and (4) assess needs for future conservation and critical habitat management.

## METHODS

In 1940 the present range of the lesser prairie-chicken in Texas was mapped (Fig. 1a) (Henika 1940) and in 1989, both the present and historical ranges were mapped (Fig. 1b) (Brownlee 1990). Methods used by Henika (1940) to delineate occupied range are



not known, but Brownlee (1990) obtained estimates by using Landsat images, field reconnaissance, landowner surveys, and interviews with personnel from the Soil Conservation Service (Natural Resource Conservation Service). Present estimates of occupied range in the Texas Panhandle are similar to those provided by Brownlee (1990), except for several isolated leks found in Deaf Smith and northern Hockley counties in 1997 (D. A. Swepston, Texas Parks and Wildlife, pers. comm.).

Surveys of lesser prairie-chicken in Texas began in 1942 on two study areas in the northeastern portion of the Panhandle. Study Area 1 (40,469 ha) consisted predominantly of sand sagebrush and mixed-grass rangeland north along the Canadian River in Hemphill County, whereas Study Area 2 (2,720 ha) was composed predominantly of shinnery oak and mixed-grass rangeland southeast of Allison in Wheeler County. At time of its establishment, the Wheeler County study area was thought to have the highest breeding density of birds in the Panhandle (Jackson and DeArment 1963).

Intensive surveys, starting before and ending three hours after sunrise, were conducted on both study areas during late March and early May 1942. Leks were located by listening for courtship activities before sunrise and counting numbers of males present on each lek. Data were collected in this manner in 1942 and from 1952 through 1986. During 1987 to 1996, four leks were randomly selected on both study areas, as were four additional leks in Lipscomb County at the extreme northeastern edge of the Panhandle. For all sites, number of males per lek was recorded yearly. This sampling strategy continued until intensive surveys of each site resumed in 1997. In addition, starting in 1969 one lek in each of six counties in the southwestern Panhandle (Permian Basin) was surveyed. In 1997 two additional study areas were established in Gaines (5,439 ha) and Bailey (3,732 ha) counties. In 1999 a third study area (3,731 ha) was established in Yoakum County.

Population trends were evaluated by use of: (1) average number of males per lek for both the southwestern (1969 to 1999 and 1990 to 1999) and northeastern panhandles (1942 to 1999 and 1990 to 1999), and (2) leks per unit area (1942 to 1986; Hemphill County and Wheeler County study areas). Data on number of males per lek in the northeastern Panhandle included leks in Collingsworth, Donley, Gray, Hemphill, and Wheeler counties. Data for the southwestern Panhandle were from Andrews, Bailey, Cochran, Gaines, Hockley, Terry, and Yoakum counties. Long-term population trends were examined by use of correlation analysis and Model I simple linear regression (BIOΣTAT COR and REG) (Pimentel and Smith 1990). Single classification analysis of variance (ANOVA) was used to test the null hypothesis of no significant difference in average number of males per lek and average number of leks per unit area between the Hemphill County and Wheeler County study sites (Pimentel and Smith 1990).

## RESULTS

### Distribution

The historical range of the lesser prairie-chicken in Texas has been estimated to extend throughout most of the sandy grasslands of the Panhandle, from Andrews County

in the southwest to Lipscomb County in the northeast (Jackson and DeArment 1963) (Fig. 1a). Early accounts documented the lesser prairie-chicken as far south as Concho, Callahan, and Clay counties (Jackson and DeArment 1963, Litton 1978). Birds in these areas were thought to be winter migrants rather than year-round residents (Bent 1932, Jackson and DeArment 1963). However, Taylor and Guthery (1980) hypothesized that birds in the southern portion of the range inhabited vegetative communities similar to those used during the breeding season. Presently, the lesser prairie-chicken inhabits a fragmented geographic and ecologic landscape within 12 counties in Texas (Fig. 1b).

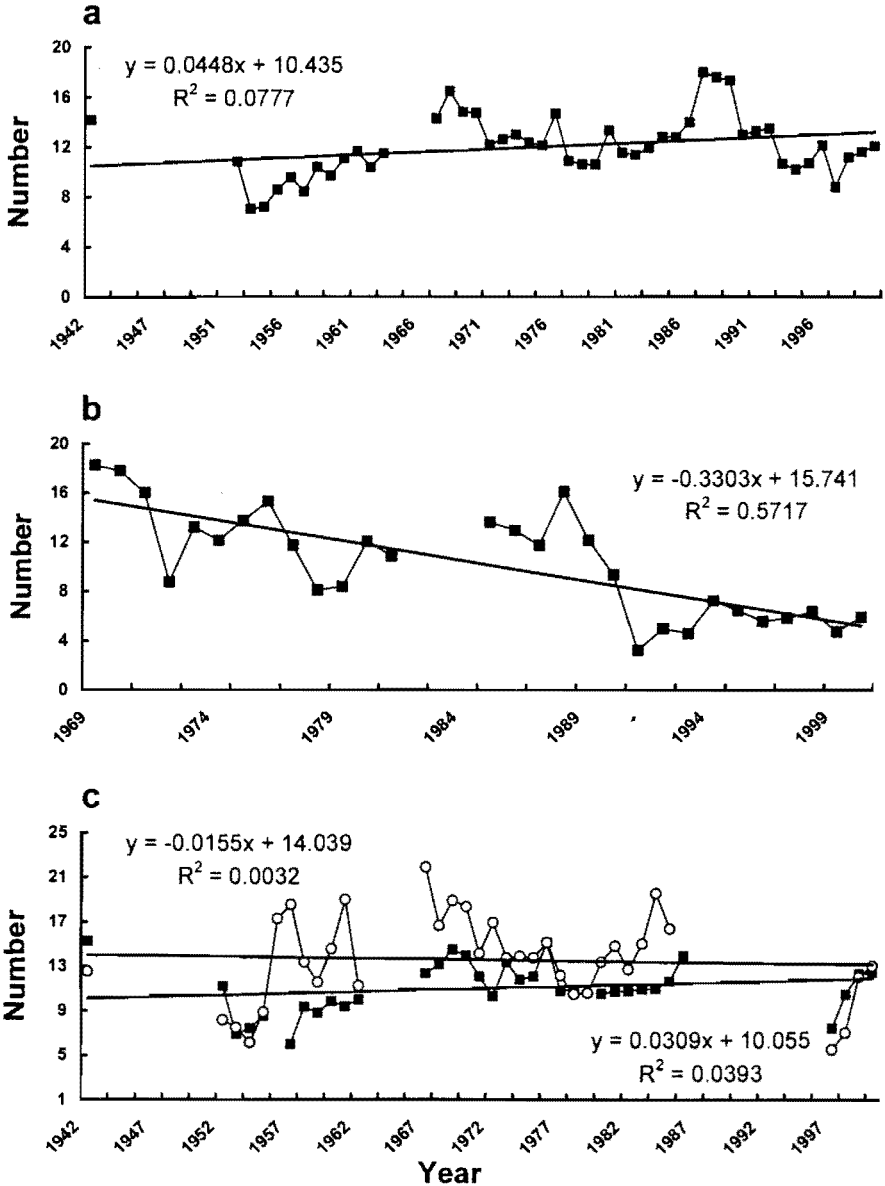
The lesser prairie-chicken reached its greatest abundance in the Panhandle of Texas sometime in the last century. Prior to the beginning of the 20<sup>th</sup> century, it was estimated that more than two million lesser prairie-chicken occurred in the Texas Panhandle (Litton 1978), which may have been the core of its wintering grounds (Mote et al. 1999). However, Taylor and Guthery (1980) hypothesized these were resident birds. Since 1940, the occupied range of the species in Texas has decreased by 78.3% (1,070,426 ha). Most of this loss occurred in the southwestern and east-central Panhandle, whereas populations in the northeastern Panhandle remained relatively stable. Small expansions of range occurred in Bailey, Cochran, Gray, Hemphill, Lipscomb, Terry, and Wheeler counties in association with the Federal Conservation Reserve Program (CRP) (K. D. Mote, Texas Parks and Wildlife, pers. comm.).

### Population Trends

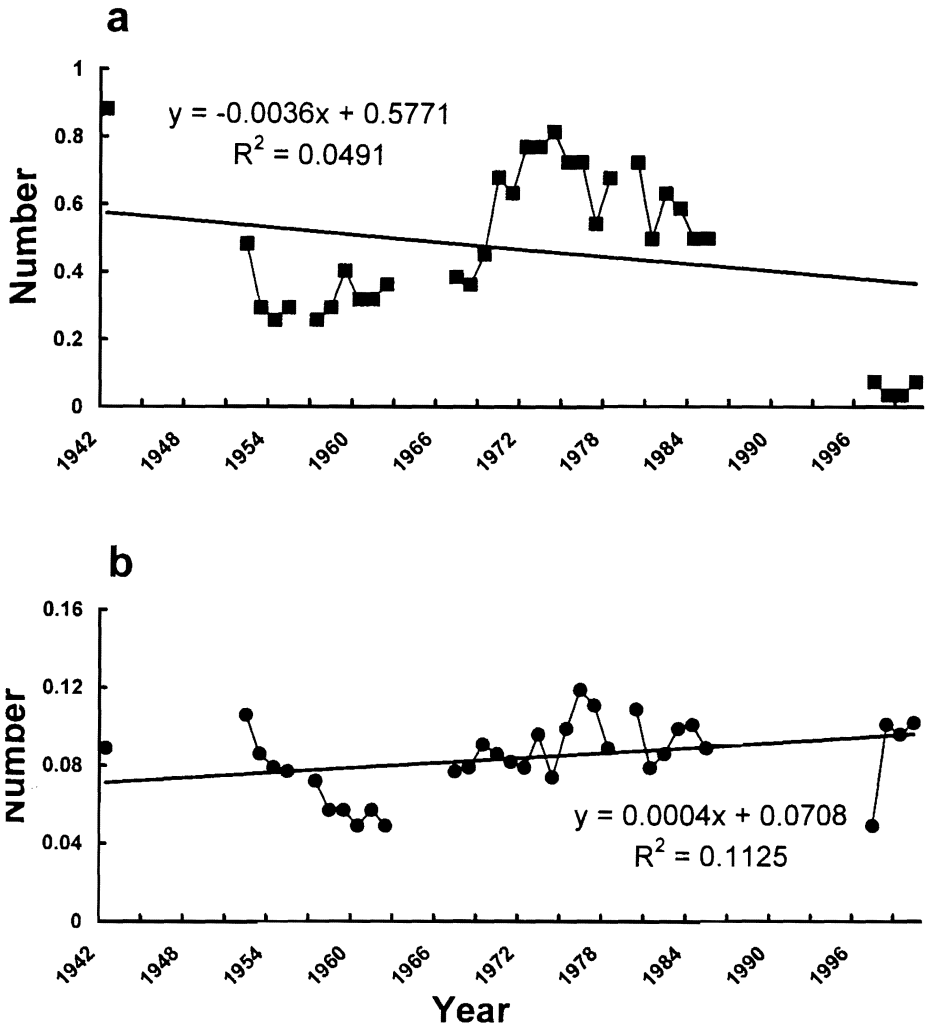
In the northeastern Panhandle, analysis of the historical trend in average number of males per lek showed a significant ( $r = 0.29$ ,  $df = 45$ ,  $P = 0.047$ ) increase since 1942, irrespective of the cessation of sampling during 1943 to 1951 and 1964 to 1966 (Fig. 2a). In the southwestern Panhandle, average number of males per lek decreased dramatically from 1969 to 1981 and from 1985 to 2000 ( $r = -0.76$ ,  $df = 27$ ,  $P < 0.0001$ ; Fig 2b). There has been no significant ( $r > 0.13$ ;  $df = 9$ ;  $P > 0.185$ ) decline in this measure of male breeding activity in the northeastern or southwestern panhandle regions from 1990 to 2000. Over the last decade, number of males per lek in the northeastern Panhandle was 5.9% below the 1942 to 1989 average, whereas in the southwestern Panhandle this variable was 54.9% below the 1969 to 1989 average.

Numbers of males per lek in the Hemphill County and Wheeler County study areas were significantly correlated ( $r = 0.40$ ,  $df = 31$ ,  $P = 0.019$ ); however, neither study area showed a significant increase or decrease in this variable over time ( $r = 0.20$ ,  $df = 32$ ,  $P = 0.260$  and  $r = -0.06$ ,  $df = 33$ ,  $P = 0.746$ , respectively, Fig. 2c). Historically, average number of males per lek on the Wheeler County study area was significantly greater ( $F = 10.7$ ,  $df = 1, 64$ ,  $P = 0.001$ ) than on the Hemphill County study area (mean = 13.6 males per lek vs. mean = 11.0, respectively).

Historical estimates of the average number of leks per unit area (100 ha) also showed no significant overall increase or decrease in either the Hemphill County ( $r = 0.32$ ,  $df = 32$ ,  $P = 0.062$ ; Fig. 3a) or Wheeler County study areas ( $r = -0.17$ ,  $df = 33$ ,



**Figure 2.** Average number of male lesser prairie-chicken per lek in the (a) northeastern Panhandle of Texas (historical transect data: 1942, 1952-63, and 1967-2000), (b) southwestern Panhandle of Texas (historical transect data: 1969-81, 1985-2000, and (c) northeastern Panhandle Study Area 1 (Hemphill Co.; 1942, 1952-55, 1957-62, 1967-78, 1980-86, 1997-2000; circles) and Study Area 2 (Wheeler Co.; 1942, 1952-62, 1967-85, 1997-2000; squares).



**Figure 3.** Estimates of average number of leks per 100 ha in the northeastern Panhandle of Texas: (a) Study Area 1 (Hemphill Co.; 1942, 1952-55, 1957-62, 1967-78, 1980-86, 1997-2000; circles), (b) Study Area 2 (Wheeler Co.; 1942, 1952-62, 1967-85, 1997-2000; squares).

$P = 0.320$ ; Fig. 3b), yet several major fluctuations were evident. For example, leks per unit area increased significantly from 1952 to 1986 ( $r = 0.47$ ,  $df = 27$ ,  $P = 0.010$ ) on the Hemphill County study area (Fig. 3a) and from 1952 to 1974 on the Wheeler County study area ( $r = 0.81$ ,  $df = 17$ ,  $P > 0.001$ ; Fig. 3b). Additionally, on the Wheeler County study area this variable declined precipitously ( $r = -0.77$ ,  $df = 10$ ,  $P = 0.003$ ) from 1974



to 1985 (Fig. 3b). The 1997 to 2000 lek per unit area average for the Hemphill County study area was 4.1% above the 1942 to 1986 average, whereas on the Wheeler County study area, this variable was 89.5% below average.

Historically, the average number of leks per unit area was significantly ( $F = 85.7$ ,  $df = 1, 64$ ;  $P < 0.001$ ) greater for the Wheeler County study area (mean = 0.47) than for the Hemphill County study area (mean = 0.08). Analysis of the extent of association between average number of males per lek and number of leks per unit area was significant for the Hemphill County study area ( $r = 0.45$ ,  $df = 30$ ,  $P = 0.009$ ), but not for the Wheeler County study area ( $r = 0.25$ ,  $df = 33$ ,  $P = 0.139$ ). Because data on leks per unit area appeared to provide the best estimate of breeding male density (Cannon and Knopf 1981), collection of these data were initiated in newly established study areas in the southwestern Panhandle.

## DISCUSSION

The most compelling evidence for a decline in populations of the lesser prairie-chicken in Texas was the decrease in occupied range since 1940. Factors responsible for this loss include cultivation of native rangeland (Crawford and Bolen 1976a, Taylor and Guthery 1980, Litton et al. 1994), poor range management practices (Jackson and DeArment 1963, Taylor and Guthery 1980), and oil and gas development (Crawford and Bolen 1976b, Davis et al. 1979). Year-to-year fluctuations in population trends are likely influenced by these factors in combination with abiotic factors such as drought (Jackson and DeArment 1963, Taylor and Guthery 1980, Giesen 1998).

Agricultural changes in land use practices likely have adversely affected populations of lesser prairie-chicken in the Texas Panhandle more than any other factor. Intensive cultivation of cotton in the southwestern and east-central Panhandle has converted vast areas of rangeland to cropland, which lacks the necessary vegetative structure and food required to sustain viable populations of this species. Dryland agriculture, in conjunction with encroachment of brush due to poor range management practices (Taylor and Guthery 1980), has resulted in habitat unsuitable for long-term sustainability of viable populations of lesser prairie-chicken throughout much of the species historical range. Establishment of the CRP in 1985 resulted in 1.5 million ha being enrolled in the Texas Panhandle (Lutz et al. 1994). Although establishing large tracts of grassland has not been detrimental to lesser prairie-chicken, the vegetative structure of these newly created monocultural grasslands has not provided optimal habitat for the species.

Historically, most CRP plantings in the Texas Panhandle were comprised of non-native grasses such as weeping lovegrass (*Eragrostis curvula*), yellow bluestem (*Bothriochloa ischaemum*), and Kleingrass (*Panicum coloratum*) planted in monocultural stands that provide little brood rearing or fall and winter cover (Litton et al. 1994, Bidwell et al. 1995). Although re-authorization of the CRP in 1996 favored wildlife in the Southern Great Plains due to a greater emphasis on wildlife habitat,

implementation of CRP in the Texas Panhandle will have to improve if lesser prairie-chicken is to benefit. CRP plantings incorporating a mix of native grasses and forbs may provide benefits for lesser prairie-chicken as well as other prairie species (Litton et al. 1994, Bidwell et al. 1995, Applegate and Riley 1998).

Impacts from oil and gas development on populations of lesser prairie-chicken in the Texas Panhandle are largely unknown. Although the species will use abandoned oil pads as lek sites (Crawford and Bolen 1976b), effects of disturbances associated with oil and gas exploration are not clear. Crawford and Bolen (1976b) noted that elevated roads near active lek sites often caused lek abandonment, and cited increased visual obstruction and disturbance associated with increased traffic as causative factors. Creation of roads associated with oil and gas exploration in previously roadless rangeland also may enable mammalian nest predators to more easily locate nests of lesser prairie-chicken, thus decreasing nesting success (Reijnen et al. 1995).

Ring-necked pheasant (*Phasianus colchicus*) has been documented disrupting courtship activities of lesser prairie-chicken on Study Area 2, and the ring-necked pheasant population has increased dramatically on this site during the past five years (T. W. Hinkle, Texas Parks and Wildlife, pers. comm.). Negative effects of ring-necked pheasants on prairie grouse are well documented (Vance and Westemeier 1979, Westemeier et al. 1998).

## RESEARCH NEEDS

Major research projects currently underway address the significant contraction in habitat occupied by lesser prairie-chicken in the Texas Panhandle since 1940 and lesser prairie-chicken in Texas breeding in nontraditional habitats such as CRP fields surrounded by intensive agriculture. Future research should focus on experimental approaches to assess: (1) effects of brush control by use of control and pretreatment study designs, (2) relationship of lesser prairie-chicken abundance to differences in shrub densities, and (3) interactions between effects of shrub control and grazing in both sandsage and shinnery oak habitats.

## INCENTIVES FOR CONSERVATION AND MANAGEMENT

Although some populations of lesser prairie-chicken in Texas have remained stable since 1942, apparently an overall decline in this species has occurred during the past 60 years, especially in the southwestern and portions of the northeastern panhandles (Wheeler County study area). CRP and other habitat management strategies need to be implemented in a manner that mimics native rangelands (Bidwell et al. 1995, Applegate and Riley 1998).

Implementation of CRP and other habitat management strategies at the state level, however, needs to be evaluated critically. Programs that provide financial incentives

or technical assistance to conduct specific management practices for rare, unique, or declining natural resources at the species and community levels are currently available through the Texas Parks and Wildlife (TPW) Landowner Incentive Program (LIP), United States Fish and Wildlife Service Partners Program, and other programs designed to enhance wildlife habitat available through the NRCS. Landowner incentive programs are integral to conservation and long-term sustainability of lesser prairie-chicken, as well as other "at-risk" prairie species. Additional opportunities exist for development of programmatic Candidate Conservation Agreements with Assurances (CCAA) and Safe Harbor agreements (Federal Register 1999).

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