

STATUS, PROBLEMS, AND RESEARCH NEEDS OF THE LESSER PRAIRIE CHICKEN

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Abstract: During the past 100 years, the range and population size of the lesser prairie chicken (*Tympanuchus pallidicinctus*) decreased by more than 90%. Overgrazing of rangelands and developments of extensive tracts of cultivation largely accounted for this decline. Grazing and cultivation remain as the principal land use factors affecting lesser prairie chicken populations. During 1979, the continental population during fall was estimated at 44,400 to 52,900 birds; trends were stable to declining. This species was the subject of numerous scientific inquiries, but many aspects of its life-history, ecology, and biology remain unknown. Habitat requirements, especially on small units of land, and the role of limiting factors, such as the relationship of weather to reproduction and survival, rank as high priorities for research. Other research needs include a better understanding of the effects of land use, evaluation of potential management procedures, studies of population dynamics, censusing techniques, and behavior.

My purpose is to trace the history and status of lesser prairie chicken populations relative to the effects of human activities, to report the current status, to identify problems related to the management of this species, to summarize previous research, and to propose certain areas of research worthy of investigation.

A number of biologists were contacted regarding the status of lesser prairie chicken populations and habitat and research needs during the preparation of this paper. This work represents a synthesis of some of the ideas and information provided by these biologists, the literature on the lesser prairie chicken, and my own research experiences and ideas. I gratefully acknowledge the assistance of the following people: M.E. Byard, R.W. Cannon, C.A. Davis, D. Dvorak, F.S. Guthery, D.M. Hoffman, G.J. Horak, R.E. Jones, H.G. Kothmann, W. McCaslan, J.D. Miller, A.K. Montei, J.H. O'Connor, R.J. Robel, R.S. Saito, J.L. Sands, and M.A. Taylor. R.G. Anthony and B.E. Coblenz critically reviewed the manuscript. This is Technical Paper No. 5352 of the Oregon Agricultural Experiment Station.

HISTORICAL PERSPECTIVE

Little is known about the prehistoric distribution of the lesser prairie chicken, although Hubbard (1973) postulated its presence in the Chihuahuan Refugium during Pleistocene glaciation. The earliest specimens were taken

in the Staked Plains in 1854 by Pope (Bailey 1928). Numerous accounts relating to the latter 1/2 of the 19th century indicated that lesser prairie chickens were abundant and broadly distributed within their range (Bendire 1892, Judd 1905, Bent 1932, Baker 1953, Sands 1968) (Fig. 1). This bird was described initially in 1873 by Ridgway (1873) as a race of greater prairie chicken (*T. cumido*), but was assigned species status in 1885 (Ridgway 1885). During the late 1800's, land development began within the range of the lesser prairie chicken, primarily in the form of grazing by cattle; before the turn of the century, farms were established in parts of this area.

Litton (1978) reported estimates of 2 million prairie chickens in Texas prior to 1900. If derived from winter counts, the 2 million birds may have represented a large percentage of the total population because Texas seemingly was the primary wintering area (Fig. 1). Although population estimates were unavailable, lesser prairie chickens reportedly were common to abundant throughout their range during the first several decades of the 20th century (Bent 1932, Baker 1953, Bailey and Niedrach 1965, Oberholser 1974). During this time, overgrazing of rangelands continued and increasing amounts of land were cultivated. Apparently, early land use by settlers was not detrimental to lesser prairie chicken populations. Cultivation of former rangeland resulted in some loss of habitat (Copelin 1959a), but the "patchwork" arrangement of farms and agricultural

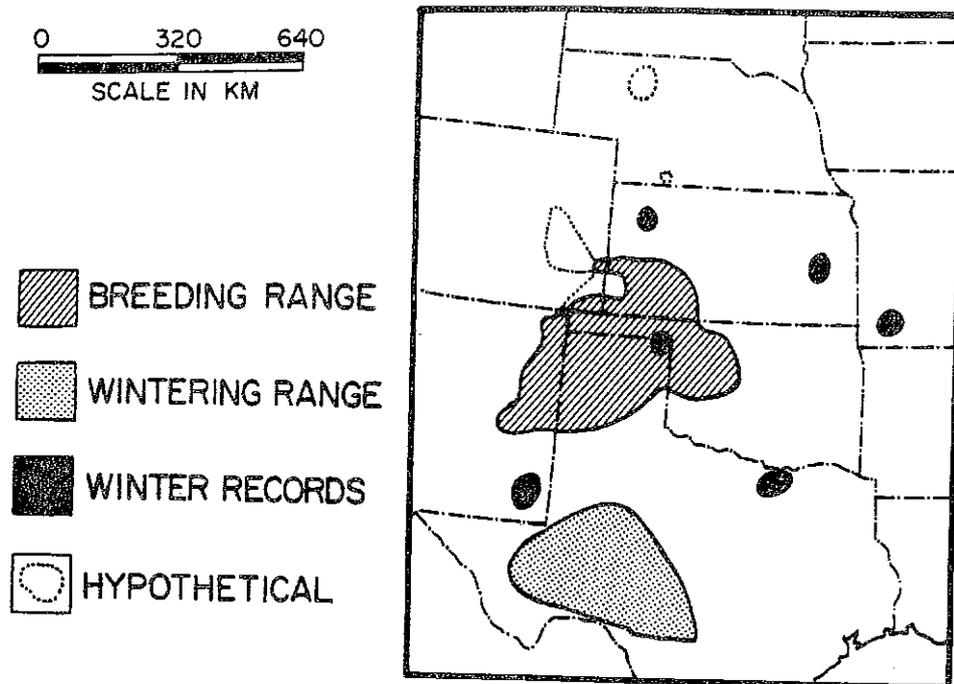


Fig. 1. Historical distribution of the lesser prairie chicken.

practices resulted initially in an increased food supply for the birds.

During the 1930's, several events occurred concurrently that resulted in extreme reductions in population numbers and contraction of the range of the lesser prairie chicken. Much of the range in the southern plains was depleted from intensive grazing, and a considerable amount of habitat valuable to prairie chickens was destroyed by cultivation. The poor condition of the habitat combined with the severe drought of the 1930's reduced the Texas population to 12,000 birds by 1937 (Oberholser 1974), resulted in the near extirpation of the species in Colorado (Bailey and Niedrach 1965), Kansas (Baker 1953), and New Mexico (Lee 1950), and caused a considerable decrease in numbers in Oklahoma (Davison 1940). During this decade, the lesser prairie chicken was established on the island of Niihau, Hawaii (Fisher 1951).

Prairie chicken numbers increased during the 1940's. However, drought during the 1950's caused marked fluctuations in population sizes. For example, Duck and Fletcher (1944) estimated the population at 15,000 birds in Oklahoma in 1940; by the 1950's, the population was reduced to between 2,500 and 3,000 individuals (Summers 1956). The Oklahoma population increased nearly 5 fold by 1960 (Copelin 1963). Between 1949 and 1961, populations in New Mexico peaked at 10,000 to 50,000 birds (Sands 1968). By the

1960's, the New Mexico population was approximately 20% of that during the previous decade (Sands 1968). From the 1960's through the 1970's, population levels decreased in Oklahoma, increased in Texas, and remained relatively stable in Colorado, Kansas, and New Mexico. Johnsgard (1973) conservatively estimated the continental population at 36,000 to 43,000 birds during the mid-1960's. Likely, the total fall population was closer to 60,000 during this time.

During the past century, the range of the lesser prairie chicken decreased by 92% (Taylor and Guthery 1980) and population size declined by 97%. In addition to reductions in range and numbers, human activities possibly altered movements by the birds. The lesser prairie chicken once was considered a migratory species; however, based on records from the American Ornithologists' Union (1957) and Oberholser (1974), this species was likely more of a "winter vagrant". Apparently, cultivation of large tracts of land resulted in the cessation of major movements during winter (Jackson and DeArment 1963). Consequently, numerous isolated populations were formed, many of which gradually disappeared.

CURRENT STATUS AND PROBLEMS

Lesser prairie chicken populations occur in 6 states (Fig. 2). The lesser prairie chicken is listed as threatened in Colorado where the fall population numbers about 500 (Table 1). Virtually nothing is known about this species in Hawaii, except that it is present. The lesser prairie chicken has not been observed in Missouri for nearly a century, and the species is considered hypothetical in Nebraska (Sharpe, pers. comm.). The lesser prairie chicken is a gamebird in Kansas, New Mexico, Oklahoma, and Texas where fall populations number between 6,000 and 18,000 per state (Table 1). Current estimates for the contiguous 48 states yield a total fall population of 44,400 to 52,900 birds (Table 1). Currently, lesser prairie chicken populations are stable to declining. The bird was listed by the U.S. Fish and Wildlife Service in publications dealing with rare, threatened, and endangered species (U.S. Fish and Wildlife Service 1966, 1973), but no special status was assigned.

Current threats to lesser prairie chicken populations and their habitat parallel those listed by Bent (1932) and Hamerstrom and Hamerstrom (1961) and include overgrazing of rangelands and extensive cultivation. In rangeland habitats, brush control may be a detriment to prairie chicken populations (Jackson and DeArment 1963) or an asset (Donaldson 1969) depending on the plant community, and the type and extent of control. Elimination of native range for the establishment of pastures, commonly switch grass (*Panicum virgatum*), may result in increased

grass cover for use by lesser prairie chickens, but on a large scale it is detrimental because of the loss of the brush component. Although extensive conversion of rangeland to cultivation is detrimental, a limited amount of cultivation adjacent to suitable habitat apparently is beneficial (Crawford and Bolen 1976a). Technological advances in agriculture resulted in mixed effects of lesser prairie chicken populations. Modern farming methods and equipment reduce waste grain, an important source of food for prairie chickens in agricultural areas (Crawford and Bolen 1976b). Use of center-pivot irrigation systems to allow cultivation of previously non-arable lands results in reduction of available rangeland habitat. Waddell and Manzlick (1978) estimated that lesser prairie chicken habitat in Kansas was lost at rates varying from 1.5 to 6% annually, largely because of center-pivot irrigation. Contrastingly, minimum tillage techniques may be of considerable benefit (Crawford and Bolen 1976a). Gas, oil, and mineral development may increase human access to areas and result in disturbance of birds (Davis et al. 1979). However, abandoned oil pads provide lek sites (Crawford and Bolen 1976c, Taylor 1980, Davis, et al. 1979).

Of the currently occupied range of the lesser prairie chicken, 95% is in private ownership; the remaining 5% (2/3 of which is in New Mexico) is administered primarily by the U.S. Forest Service and the Bureau of Land Management (Taylor and Guthery 1980).

Although once subjected to market hunting (Judd 1905), lesser prairie chickens have received

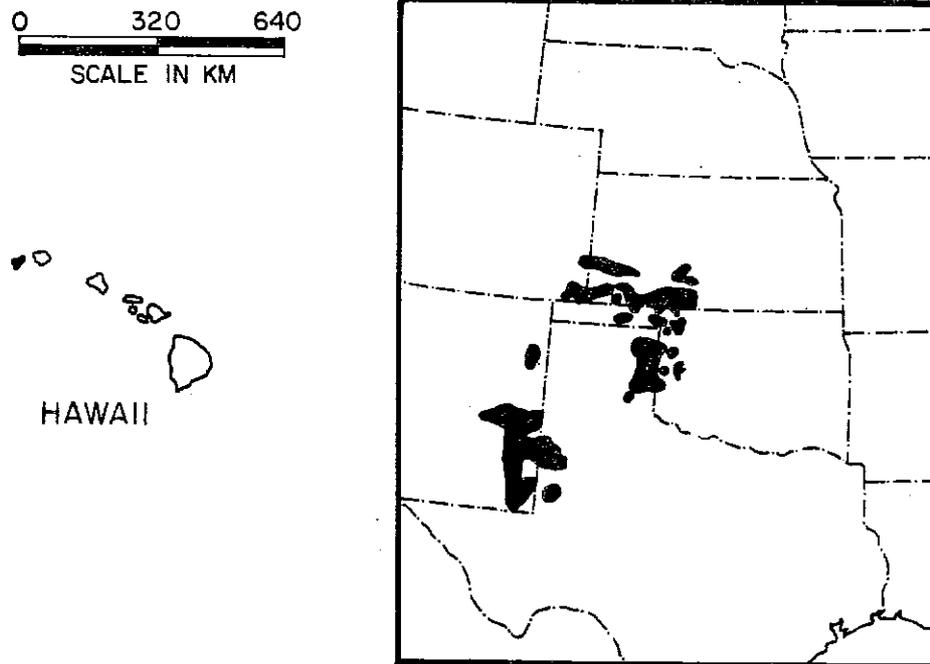


Fig. 2. Current distribution of the lesser prairie chicken.

Table 1. Numbers, harvest figures, status, and trends of lesser prairie chicken populations in 1979.

State	Fall population	Approximate harvest	Status	Trend
Colorado	400-500	0	Threatened	Stable
Hawaii	Unknown	Unknown	Introduced	Unknown
Kansas	17,000-18,000	2900	Gamebird	Declining
Missouri	0	0	Extirpated	
Nebraska	0	0	Hypothetical	
New Mexico	10,000	1200	Gamebird	Stable
Oklahoma	6,000-6,400	1000	Gamebird	Stable-Declining
Texas	11,000-18,000	600	Gamebird	Stable-Declining

the protection of restrictive season lengths and bag limits for nearly 80 years. The current kill averages approximately 12% of the fall population and ranges from 0 to about 20% in local populations. Except in areas of the poorest habitat, hunting mortality likely is compensatory.

PREVIOUS RESEARCH AND FUTURE NEEDS

Previous research efforts focused largely on life history and ecology (Copelin 1958b, 1963; Hoffman 1963; Jackson and DeArment 1963; Litton 1978; Davis et al. 1979) and habitat requirements (Jones 1963a, 1963b, 1964a, 1964b; Crawford 1974; Suminski 1977; Taylor 1978). Nevertheless, a better understanding is needed of the habitat (i.e. food, water, cover, and space) of the lesser prairie chicken. Studies by Frary (1957, 1959), Copelin (1960, 1963), Crawford and Bolen (1976b and Davis et al. 1979) revealed considerable plasticity in the diet of this species. However, little information is available on dietary preferences and energy requirements in various habitats or on the relationship of breeding success and survival to diet. Drinking of water by lesser prairie chickens was documented by Copelin (1963), Jones (1964a), Crawford and Bolen (1973), and Davis et al. (1979), yet Frary (1957) found little use of water developments in his study. Thus, the necessity of free water, especially during periods of drought, bears further investigation.

Brush species such as shinnery oak (*Quercus havardii*) or sand sagebrush (*Artemisia filifolia*) and tall grasses like sand bluestem (*Andropogon hallii*) constitute the critical components of lesser prairie chicken habitat. Because of ever-decreasing amounts of habitat available to lesser prairie chickens, determination of the minimum size area that can support a population is one of the most critical research needs.

Experimental studies should be conducted to determine if intensively managed, small units of brush-grassland habitat can support viable populations. Identification of minimum areas and necessary habitat components is the only way to reduce the progressive elimination of small populations. Basic studies in behavioral ecology and movements of the birds are needed to delineate space requirements.

As biologists, we usually assume that most limiting factors of galliform populations function in a density-dependent fashion. Therefore, limiting factors have received only minimal attention by researchers. Virtually nothing is known about the parasites and diseases of this species with the exception of the description of helminths by Pence and Sell (1979). Campbell (1950), Frary (1955), Davis et al. (1979), and other general references provided what little is known about predators of lesser prairie chickens. Ligon (1951) and Copelin (1963) discussed accidents, particularly collision with power lines, as decimating factors in the species. Most biologists would agree that the fate of a grouse population lies in the quality of the habitat and not in the proximate limiting factors addressed above. However, factors that act in a density-dependent manner in good habitat may function in a density-independent fashion in marginal habitat and become critical factors to be addressed in management. Research dealing with the effects of predators, diseases, or similar factors must incorporate the condition of the habitat and status of the population if it is to be of value.

Immediate attention should be directed to the role of weather as a limiting factor. The sensitivity of lesser prairie chickens to drought is well documented (Hamerstrom and Hamerstrom 1961); however, the specific action is unknown.

A long-term project relating weather in conjunction with habitat characteristics to population status (e.g. size, breeding success, recruitment, and survival) might provide information to mitigate some of the most severe effects of drought. Without such knowledge, the recurrence of a drought like that of 1930's could greatly deplete or actually result in the extinction of the continental population.

Management procedures and effects of land use such as fire (Cannon and Knopf 1979), food plots (Copelin 1958a, 1959b), farming practices (Crawford 1974, Crawford and Bolen 1976a), brush control (Donaldson 1966, 1969), and ranching practices (Davis et al. 1979) were the subject of numerous investigations. Studies dealing with these topics should be continued and expanded. For example, range improvement practices, such as rotational grazing and prescribed burning, require study. More information on the relative effects of various brush control procedures would be valuable, and alternatives to traditional brush control methods, especially in sand sagebrush areas, should be investigated. Potential management procedures including the creation of lek sites should be further developed and tested. Counts of males at leks traditionally are used to enumerate lesser prairie chicken populations, yet little is known about the accuracy or precision of these counts. Development of improved censusing methods is a fundamental research need. Banding studies to augment the works of Davison (1940), Lee (1950), and Campbell (1972) are necessary for a better understanding of the population dynamics of this species. Although numerous techniques are available to determine sex and age of lesser prairie chickens, the chronology of primary feather replacement in juveniles to determine the timing of reproductive activities is unknown.

The lesser prairie chicken is a most worthy subject for research in basic biology. The reproductive behavior of males is rather well known (Grange 1940; Sharpe 1968; Hjorth 1970; Crawford and Bolen 1975, Crawford 1978), but other behaviors, especially of females, remain poorly understood. The taxonomic status, investigated by Jones (1964a), Short (1967) and Sharpe (1968, 1969), remains unresolved. Most anatomical studies, with the exception of Tiemeier (1941) and Holmes (1963), dealt with plumages and other external characteristics (Ridgway and Friedmann 1946; Sutton 1964, 1968, 1977; Crawford 1978).

It is possible that certain currently unoccupied habitats may be able to support prairie chicken populations. Because of the rather slow pioneering rate of this species, reintroduction in selected areas may be a viable strategy for enhancement of populations. Reintroduction attempts are fraught with difficulties and should be attempted only after adequate research advance preparation, and in conjunction with intensive monitoring of released birds. We have some information on propagation of captive birds (Ligon 1954, Coats

1955), but introductions attempted with birds raised on game farms often fail. Additional considerations involve the difficulty of capturing wild birds, the effects of trapping and removal of birds on source populations, and the problem of establishment of populations of transplanted birds.

The range of the lesser prairie chicken has diminished greatly in the past 100 years, and current populations are fragmented into discrete units. Although the current population numbers in the many thousands, we as biologists and managers should not become complacent because numbers do not impart stability to lesser prairie chicken populations. Constant attention is needed to maintain existing populations because of continually changing land use practices. Innovative research and aggressive management will help offset losses and degradation of lesser prairie chicken habitat; enlightened research will aid our understanding of those factors that control populations.

The lesser prairie chicken is at a threshold. It is not sufficiently rare to elicit intensive management and research efforts as is the Attwater's prairie chicken (*T. c. attwateri*), nor is it as wide spread as the northern greater prairie chicken (*T. c. pinnatus*) to have broad-scale support. Thus, the responsibility lies with a rather small group of people from federal and state agencies, universities, and other interested parties to provide the necessary information and to implement required actions.

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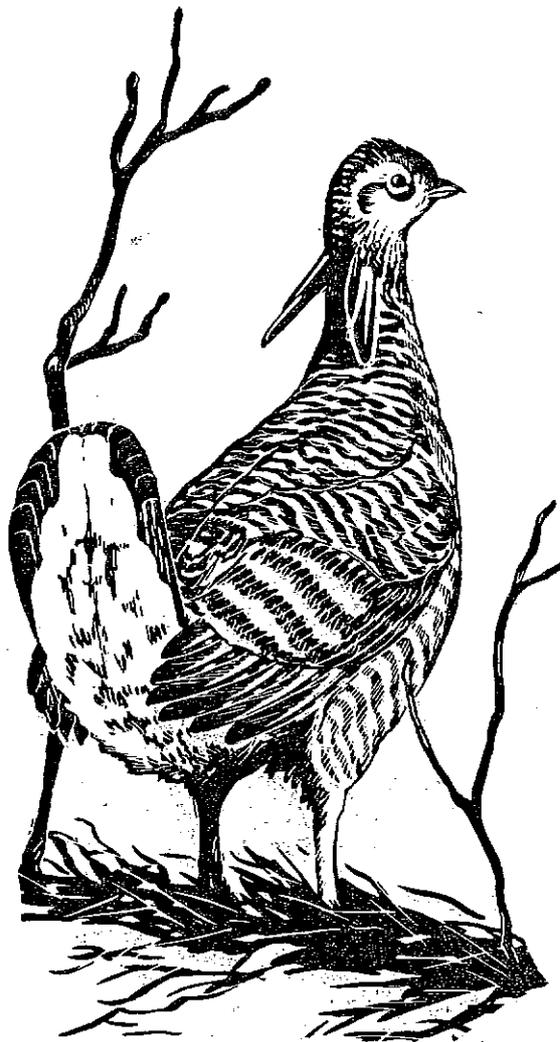
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