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CURRENT STATUS, DISTRIBUTION, AND CONSERVATION OF THE BURROWING OWL IN OKLAHOMA

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ABSTRACT.—In Oklahoma, the Burrowing Owl (*Athene cunicularia*) historically inhabited much of the western half of the state. Over the last century, habitat destruction and alteration, including destruction of prairie dog (*Cynomys* spp.) colonies, have taken a toll on the remaining Burrowing Owls in Oklahoma. Currently, owls occupy only a relatively small portion of their historical range in the state. A recent survey indicated that total colony area in the state continues to decline, decreasing 4–7% over the past 10 yr. As prairie dogs continue to be eradicated by humans and impacted by plague over significant areas of Oklahoma, it is not surprising that Burrowing Owls continue to decline. Currently, there are an estimated 800–1000 Burrowing Owls breeding in Oklahoma, and most of these occur in the three panhandle counties (Cimarron, Texas, and Beaver). Breeding Bird Survey data showed that the Burrowing Owl population has significantly declined (12.3%/yr) in the state. Christmas Bird Count data, although limited, also suggest decreasing numbers of wintering Burrowing Owls in the state. These findings are a cause of great concern for the Burrowing Owl in Oklahoma. Major cooperative efforts are needed to ensure that viable populations of Burrowing Owls continue to exist throughout the species' range in Oklahoma.

KEY WORDS: *Burrowing Owl*; Athene cunicularia; *status*; *distribution*; *conservation*; *black-tailed prairie dog*; Cynomys ludovicianus; *Oklahoma.*

Estado actual, distribución, y conservación del Búho Cavador en Oklahoma

RESUMEN.—En Oklahoma, el Búho Cavador (*Athene cunicularia*) históricamente ha habitado la mayor parte del lado oeste del estado. En el ultimo siglo, la destrucción del hábitat y su alteración, incluyendo la destrucción de las colonias de perros de la pradera (*Cynomys* spp.) ha tomado un numero de bajas en los restantes Búhos Cavadores de Oklahoma. Actualmente los búhos ocupan solamente una porción relativamente pequeña de su rango histórico en el estado. Un estudio reciente indicó que el área total de las colonias de los perros de la pradera continua disminuyendo abruptamente, decreciendo 4–7% en los últimos 10 años. Como los perros de las praderas están siendo erradicados por los humanos y devastados por la peste sobre áreas significativas de Oklahoma, no es sorprendente que el numero de Búhos Cavadores continúe decayendo. En la actualidad, hay un estimado de 800–1000 Búhos Cavadores reproduciéndose en Oklahoma, y la mayoría de estas ocurren en los tres condados de la región "manija" (Cimarron, Texas, y Beaver). Los datos del Estudio de Aves en Reproducción muestran que las poblaciones de búho cavador han decrecido significativamente (12.3%/año) en el estado. La continuación de estas tendencias resultará probablemente en la necesidad de protección legal bajo la ley estatal de especies en peligro. Se necesitan esfuerzos cooperativos mas grandes para asegurar que poblaciones viables de Búhos Cavadores continúen existiendo a lo largo y ancho de su rango en Oklahoma.

[Traducción de Victor Vanegas y César Márquez]

Historically, the Burrowing Owl (*Athene cunicularia*) inhabited the western one-half of Oklahoma (Baumgartner and Baumgartner 1992, Haug et al. 1993). Prior to settlement of the Oklahoma Territory in the 1880s, Burrowing Owls were locally common summer residents in grasslands of central and western Oklahoma, but they were largely ex-

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tirpated by 1930 (Baumgartner and Baumgartner 1992). They were commonly found in shortgrass prairie habitats and were closely associated with black-tailed prairie dogs (*Cynomys ludovicianus*). Currently, they are a rare and local summer resident, mainly in the Oklahoma panhandle and other western counties (Baumgartner and Baumgartner 1992). Modern development and agriculture have resulted in large-scale destruction and alteration of Burrowing Owl habitat in Oklahoma and other Great Plains states. In addition, sylvatic plague (*Yersinia pestis*), shooting, and poisoning have greatly reduced prairie dog populations, resulting in population numbers that are only a fraction of what they were historically. Burrowing Owls today occupy only a relatively small portion of their historical range in Oklahoma, and numbers are greatly reduced from historical estimates. The largest populations are found in Cimarron County in the panhandle (Baumgartner and Baumgartner 1992). Currently, the Burrowing Owl is classified as a Species of Special Concern in Oklahoma (Oklahoma Department of Wildlife Conservation publ. comm.). It is also a Species of Special Concern in the neighboring state of Kansas, but has no official listing in either Texas or New Mexico (Sheffield 1997a). The black-tailed prairie dog, a species that is ecologically linked to the Burrowing Owl in the Great Plains, is also classified as a Species of Special Concern in Oklahoma (Oklahoma Department of Wildlife Conservation publ. comm.).

To date, there has been no systematic survey of Burrowing Owls in Oklahoma. In the summer of 1970, Butts (1971) studied the ecology of Burrowing Owls in Beaver and eastern Texas counties. This is the most complete estimate of population density of Burrowing Owls in Oklahoma, and there has not been a similar survey since. In 1970, the total area covered by prairie dog colonies in Oklahoma was less than half of the area it was in 1960 (Butts 1971). Burrowing Owl populations are small or nonexistent in areas of central and western Oklahoma where prairie dogs have been eradicated (Butts and Lewis 1982). The Oklahoma panhandle is still largely undeveloped, and is characterized mainly by cattle ranching, agriculture, and open prairie. In this area, prairie dog colonies are still relatively large and numerous. As you move east from the panhandle, development is more prevalent, prairie dog colonies are less frequent and more fragmented, and there are fewer Burrowing Owls (Tyler 1968, Butts and Lewis 1982, J. Shackford, J. Tyler, and L. Choate unpubl. data).

SUMMER RECORDS

The current summer (breeding) range of the Burrowing Owl in Oklahoma was derived from BBS data (1966–99), other breeding records, and personal observations. Burrowing Owl family groups have been documented during the summer months in the prairie dog colonies of 13 western counties (Fig. 1). It is likely that Burrowing Owls also nest in or around several prairie dog colonies in Cotton and Custer counties, but there are no confirmed records or sightings. Based on Tyler's (1968) data and our subjective assessment of changes since that survey, we estimated that there is a current summer population of 800–1000 Burrowing Owls in Oklahoma, with most owls occurring in the three panhandle counties (Cimarron, Texas, and Beaver; Fig. 1).

Tyler (1968) surveyed black-tailed prairie dog colonies in Oklahoma, recording a total of 788 Burrowing Owls, and derived a state population estimate of 900–1000 individuals. In his survey in 1970, Butts (1971) found a total of 543 Burrowing Owls, and estimated an overall density of nesting Burrowing Owls of approximately 0.12 owls/km^2. He also found that 66% of the nests occurred in black-tailed prairie dog colonies, although those colonies made up <20% of the total landscape surveyed. Burrowing Owl densities varied greatly between those owls occupying black-tailed prairie dog colonies (38.1 owls/km^2) and those at least 1.6 km from black-tailed prairie dog colonies (0.04 owls/km^2). All Burrowing Owl nests were found in vegetation that was <10 cm in height (Butts 1971).

According to the Oklahoma Breeding Bird Atlas (OBBA) conducted through the 2001 field season, Burrowing Owls were recorded in 32 of the 42 OBBA blocks (1.86 × 2.17 km) surveyed in the Oklahoma panhandle that also had at least one prairie dog colony (D. Reinking pers. comm.). This included 9 of 11 blocks for Beaver County, 11 of 16 for Texas County, and 12 of 15 for Cimarron County. In addition to the above, nesting records exist for Grant, Cleveland, Oklahoma, Canadian, Custer, Blaine, Woods, and Alfalfa counties. The latter records, however, ranged in date from 1909–65, and it is not clear how many of these represent annual nesting attempts by established populations opposed to accidental or occasional nesting attempts. Baumgartner and Baumgartner (1992) in-

Figure 1. Breeding range (shown in gray) of the Burrowing Owl in Oklahoma, as determined by Breeding Bird Survey data (1966–99), other breeding records, and personal observations. Gray areas denote regular breeding range.

dicated that the Burrowing Owl was not a regular breeding species in central Oklahoma prior to European settlement.

Breeding Bird Survey (BBS) data indicate that Burrowing Owls occur in many of the western counties in Oklahoma (Sauer et al. 2000). The BBS data indicate that relative abundance of Burrowing Owls is low (range 0.13–1.95) for all four physiographic regions of the state. Analysis of these data demonstrate that Burrowing Owl numbers in Oklahoma declined by 12.3% per yr during the 34-yr period from 1966–99. BBS data quality for Burrowing Owls, although less than optimal due to the relatively small number of BBS routes in the state, is nonetheless the most useful data available for determining population trends of this species in Oklahoma.

Wintering Records

The current wintering range of the Burrowing Owl is restricted to western Oklahoma (Fig. 2), based on Christmas Bird Count (CBC) data, other wintering records, and personal observations (1930–99). Most Burrowing Owls migrate south from Oklahoma in the fall (usually October) and some winter as far south as central Mexico (Butts 1976, G. Holroyd pers. comm.). Therefore, Burrowing Owls are considered either rare winter residents or are very secretive in the panhandle and the northern tier of counties in Oklahoma (Butts 1976). The winter can be relatively severe in northern Oklahoma, and Burrowing Owls facing these conditions generally migrate south for the winter. In the southwestern counties of Oklahoma, owls are considered occasional winter residents (Baumgartner and Baumgartner 1992). The survey by Butts (1976) allowed a comparison of summer and winter Burrowing Owl numbers. He surveyed an area of 4367 km^2 in the eastern panhandle and found 543 adult owls during the 1970 breeding season and 527 adult owls during the 1971 breeding season. However, he located only six owls in the same area during the 1970–71 winter (ca. 1% of the summer population).

Burrowing Owls have been recorded on CBCs at Kenton (Black Mesa), Cimarron County, Arnett (Ellis County), Oklahoma City, Oklahoma County, and Norman (Cleveland County). There have never been more than a few individuals reported from any count. In addition to winter records in the western counties, there are winter records of Burrowing Owls for a number of scattered counties in other areas of Oklahoma, including Oklahoma, Muskogee, Garvin, Tulsa, Pawnee, Payne, and Washington counties (Baumgartner and Baumgartner 1992, Sauer et al. 1996). The winter distribution of Burrowing Owls is broader than their breeding distribution in Oklahoma (Figs. 1, 2) and may be due, at least in part, to stopover of migrants

Figure 2. Non-breeding range of the Burrowing Owl in Oklahoma, as determined by Christmas Bird Count data (1930–99), other wintering records, and personal observations. Dark gray area denotes regular winter range, light gray areas denote extra-limital winter records.

from more northern parts of the range. A similar pattern of winter distribution in Texas and Mexico offers some evidence for this idea (G. Holroyd pers. comm.).

STATUS OF PRAIRIE DOGS IN OKLAHOMA

In Oklahoma, black-tailed prairie dog colonies once covered approximately 400 000 ha, but now exist only in scattered, disjunct populations (U.S. Fish and Wildlife Service 2000). Tyler (1968) reported that millions of hectares of prairie dog colonies were found historically in Oklahoma, but that by 1968, the total area of colonies had been reduced to 3856 ha. Historically, black-tailed prairie dogs were locally common and widespread in the western-most counties, including Cimarron, Texas, Beaver, Harper, and Ellis counties, but became less common eastward into the mixed-grass prairie. Most of the decline of black-tailed prairie dogs (and presumably Burrowing Owls) occurred between 1885–1925. In recent years, populations of black-tailed prairie dogs in the Oklahoma panhandle have been unstable due to sylvatic plague and active eradication programs (U.S. Fish and Wildlife Service 2000, S. Sheffield pers. observ.).

A survey of prairie dog colonies was conducted in Oklahoma for the Oklahoma Department of Wildlife Conservation (ODWC) in 1988–89 (J. Shackford, J. Tyler, and L. Choate unpubl. data). More recently, ODWC game wardens conducted a follow-up survey in the fall of 1998. Of the 399 prairie dog colonies recorded by J. Shackford and colleagues, 313 of these were revisited. At least 110 previous unrecorded prairie dog colonies were found incidentally while trying to verify the locations of the previous survey. These new colonies probably are a combination of newly colonized sites, colonies that were small 10 yr ago, colonies missed by the 1988–89 survey, and colonies for which the legal description was incorrectly recorded in 1989 so that the colony was recorded as absent in 1998 and a "new" colony was found nearby. The minimum number of colonies present in 1998 was 302, though the actual number was probably closer to 380. Population sizes in colonies were not estimated in the 1998 survey, so trends cannot be determined.

In the main part of the state, the total number of prairie dog colonies appears to have declined by about 7% (ODWC unpubl. data). In Cimarron County, the number of prairie dog colonies is estimated to have declined by 34%. This may have been due, at least in part, to the plague outbreak that was documented there in 1991–92. However, the number of prairie dog colonies in the two other panhandle counties (Texas and Beaver) seems to have increased by 19%. In central Oklahoma, black-tailed prairie dog colonies apparently were rare but some were very large.

ASSOCIATION BETWEEN BURROWING OWLS AND BLACK-TAILED PRAIRIE DOGS IN OKLAHOMA

Tyler (1968) found 280 black-tailed prairie dog colonies in his Oklahoma survey, and found Burrowing Owls inhabiting 40% of the prairie dog colonies checked. The largest number of owls in a single dog colony was 30 individuals. Butts and Lewis (1982) found that, within prairie dog colonies, Burrowing Owls aggregated their nests into clusters and often concentrated nests at edges of black-tailed prairie dog colonies. Prairie dog colonies appeared to be the only habitat with sufficient densities of burrows to provide both nesting and satellite burrows. There may be a certain minimum area of prairie dog colony(ies) required for Burrowing Owls to nest, but this threshold is not known. J. Shackford (unpubl. data) found owls in regions of the state where there were at least seven individual prairie dog colonies or at least 162 ha of prairie dog colonies in close proximity. Black-tailed prairie dog colonies in Oklahoma became unsuitable for Burrowing Owls 1–3 yr after abandonment by black-tailed prairie dogs (Butts and Lewis 1982). They suggested that Burrowing Owls nesting outside of prairie dog colonies in Oklahoma were utilizing marginal habitat and may represent individuals forced out of preferred prairie dog colony habitat (Butts and Lewis 1982).

Barko et al. (1999) found that Burrowing Owl abundance was significantly higher on sites with black-tailed prairie dog colonies than at uncolonized sites in Oklahoma during the spring and summer. They recorded Burrowing Owls on prairie dog-colonized sites of 3–302 ha ($N = 5$). Desmond et al. (2000) found strong correlations between Burrowing Owl and black-tailed prairie dog declines and provided evidence of a time lag in Burrowing Owl population response to changes in active burrow densities of prairie dogs in Nebraska between 1990–96.

In Oklahoma, there has been great variation in Burrowing Owl occupation of large versus small prairie dog colonies. Butts (1971) found a large range in the density of nesting Burrowing Owls in prairie dog colonies. He found that large colonies (>40.5 ha) in Beaver County did not have Burrowing Owls, but 19 of 21 colonies that were <4 ha in size supported Burrowing Owls. Tyler (1968) found a 1.2 ha prairie dog colony in Jackson County with 30 Burrowing Owls. These data indicate that Burrowing Owls will utilize small colonies. Therefore, assumption that larger prairie dog colonies are more likely to contain Burrowing Owls does not appear to be valid in all cases. There is some evidence that Burrowing Owls are easier to detect in smaller prairie dog colonies or colonies with fewer prairie dogs (M. Desmond and M. Restani pers. comm.).

Burrowing Owls have coevolved with prairie dogs and other colonial sciurids in the prairie grassland ecosystem in North America. They have been found to be tightly associated with prairie dog colonies in Oklahoma (Tyler 1968), Nebraska (Desmond and Savidge 1996), South Dakota (Sharps and Uresk 1990), and Wyoming (Campbell and Clark 1981). In addition, Clark et al. (1982) found a strong correlation between increased vertebrate abundance and increased colony size ($r = 0.81$). Prairie dog colonies provide heterogeneous plant cover, high densities of prey species, high seed production, low vegetation height, and good visibility of prey and predators (Clark et al. 1982). One main benefit of this close association for both owls and prairie dogs appears to be increased protection from predation (Desmond et al. 2000).

Clearly, black-tailed prairie dog colonies are critically important to Burrowing Owls in Oklahoma, as well as in much of the rest of midwestern North America (Butts and Lewis 1982). However, Burrowing Owl populations have suffered in Oklahoma because of their close ecological association with black-tailed prairie dogs. Although both black-tailed prairie dogs and Burrowing Owls were considered locally common in the state prior to European settlement, both species were virtually wiped out by a statewide poisoning campaign in 1922 (Baumgartner and Baumgartner 1992).

OUTLOOK FOR BURROWING OWLS IN OKLAHOMA

Burrowing Owls should be able to persist in the panhandle and in other western counties of Oklahoma, where there is relatively little development and where habitat has not been greatly altered. However, one problem area is Cimarron County, where the major loss of prairie dog colonies is cause for concern. Prairie dog colonies in Oklahoma should be monitored closely at least every 2–4 yr, including monitoring of both Burrowing Owls and prairie dogs. If the focus of conservation efforts is on the prairie dog/grassland ecosystem, then there is a good chance that the Burrowing Owl also will be protected in

Oklahoma. Major cooperative efforts are needed to ensure that viable populations of both species continue to exist throughout their ranges in Oklahoma so that they do not continue to decline toward endangered status.

Most of the nearly 400 prairie dog colonies in Oklahoma occur on private lands. This is of concern because there is a greater likelihood of habitat alteration and less ability to enact conservation actions on private lands. State-sponsored initiatives to conserve prairie dog colonies on private lands would address this situation.

In 2000, the ODWC began aerial transect surveys of prairie dog colonies in Cimarron, Texas, Beaver, Harper, and Ellis counties, and in 2002 will attempt to ground-truth colonies that were identified during the aerial survey. Burrowing Owls will be monitored during this effort.

Finally, Burrowing Owl mortality factors, such as pesticide poisoning, can be significant in some areas of Oklahoma, particularly in agricultural and rangeland areas where pesticides are applied, and both direct and secondary poisoning can occur (Sheffield 1997b). Conservation and management measures, education, and changes in both public attitudes and policies are necessary for the continued existence of viable populations of Burrowing Owls and grassland sciurids in Oklahoma and in North America in general (Holroyd et al. 2001).

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