Recreational Shooting: How Are Sites Selected and What Are the Implications for Burrowing Owl (*Athene cunicularia*) Reproduction?

***Jason D. Woodard and Beatrice Van Horne**

*Department of Biology, Colorado State University, Fort Collins, CO 80523

INTRODUCTION

Declines in burrowing owl populations are inextricably linked to human activity and associated disturbances. Habitat loss and rodent control programs are the primary cause of observed declines (Butts 1973). Recreational shooting, harassment, and other human disturbances may exacerbate this decline by promoting mortality and nest failure in local populations. The extent and magnitude of these effects, however, remain unknown (Haug et al. 1993, Holroyd 1998).

Research Objective:

We examined the influence of recreational shooting of black-tailed prairie dogs (*Cynomys ludovicianus*) on burrowing owl reproductive performance in northeastern Colorado (Fig. 1). Specifically, we attempted to (1) identify factors that influence shooting activity, and (2) relate recreational shooting activity to reproductive parameters.

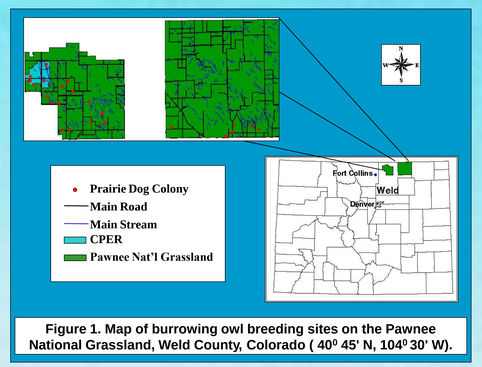

Figure 1. Map of burrowing owl breeding sites on the Pawnee National Grassland, Weld County, Colorado (40⁰ 45' N, 104⁰ 30' W).

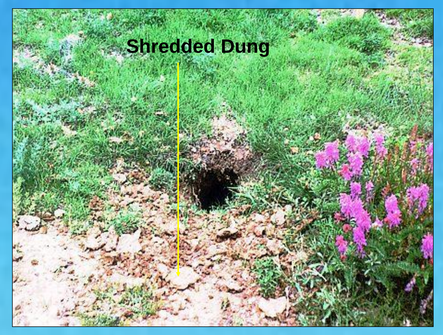

Figure 2. Burrowing owl nest depicting the shredded cattle dung frequently used to line burrow entrance.

Figure 3. Prey remains, feathers, and shredded dung clearly visible at the nest entrance.

RESULTS

- Shooting activity was correlated with land ownership and colony size (Fig. 4). Restricted to public lands, shooting activity was more likely to occur on larger colonies.
- Mean success rates were higher for non-shooting sites (x = 64.42, SD = 28.72, n = 15) than shooting sites (x = 49.16, SD = 23.31, n = 8) in 1999; however, differences were not significant (df = 1, F = 1.76, P = 0.1986). Non-shooting sites fledged more young on average than shooting sites (x = 1.60 and x = 0.95, respectively)(Fig. 5).
- In 2000, mean success and fledging rates differed by shooting intensity. This was primarily due to the poor reproductive performance of owls nesting on colonies subject to moderate shooting activity (Fig. 6). Similar reproductive output and no, low and high intensity shooting sites suggest that other factors may have contributed to observed results.

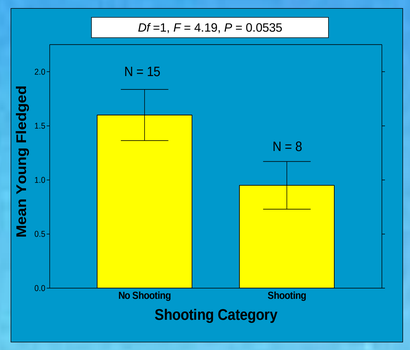

Figure 5. Mean burrowing owl fledging rates for colonies with and without shooting activity in 1999. Fledging rates were weighted to account for differences in the number of nests used to generate colony means. Bars represent standard errors. Numbers indicate sample sizes.

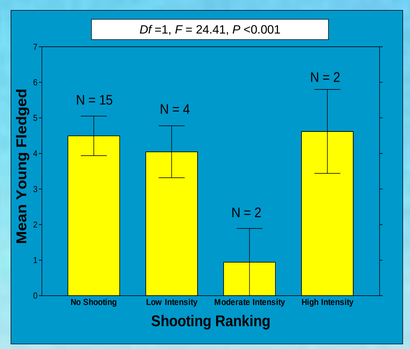

Figure 6. Mean fledging rates for colonies subject to different shooting regimes during the 2000 breeding season. Fledging rates were weighted to account for differences in the number of nests used to account for differences in the number of nests used to generate colony means. Bars represent standard errors. Numbers indicate sample sizes.

METHODS

- Monitor burrowing owl nests located on active black-tailed prairie dog colonies (Fig. 2,3).
- Estimate number of nesting pairs, success rates and young fledged for each occupied colony.
- Map nest sites and colonies using GPS unit.
- Obtain colony size, colony clustering, colony accessibility and land ownership data using a geographic information system (GIS).
- 1999 - classify colonies as shooting or non-shooting based on observation of shooting activity during weekly surveys.
- 2000 - quantify shooting activity using shell, carcass, and shooter counts, and rank colonies based on shooting intensity.
- Weight success and fledging analyses to account for the effect of nest numbers on reproductive means.

	Size	Cluster	Access	Owner	Rank	Rank2
Size	1.0000	-0.2670 0.2181	-0.3029 0.1599	-0.0781 0.7231	0.2592 0.2323	0.4190 ***0.0466***
Cluster	-0.2671 0.2181	1.0000	0.0150 0.9459	0.4844 ***0.0192***	-0.0698 0.7515	-0.0801 0.7163
Access	-0.0781 0.1599	0.0150 0.9459	1.0000	-0.1686 0.4419	0.1250 0.5700	0.0620 0.7789
Owner	-0.0781 0.7231	0.4844 ***0.0192***	-0.1686 0.4419	1.0000	-0.5200 ***0.0110***	-0.3788 0.0747
Rank	0.2592 0.2323	-0.0698 0.7515	0.1250 0.5700	-0.5200 ***0.0110***	1.0000	0.8980 ***<0.0001***
Rank2	0.4190 ***0.0466***	-0.0801 0.7163	0.0620 0.7789	-0.3788 0.0747	0.8980 ***<0.0001***	1.0000

Figure 4. Pearson correlation analysis of habitat variables and shooting data recorded during the 2000 breeding season. Top values in each row are correlation coefficients (*r*). Lower values indicate the level of significance of each relationship. The Rank2 category was created by grouping the rank 0 and 1 categories (no and low intensity shooting), and comparing reproductive performance to the rank 2 and 3 categories (moderate and high intensity shooting).

CONCLUSIONS

(1) Large prairie dog colonies on public lands were most likely to support recreational shooters.

(2) Burrowing owl reproduction varied with shooting activity. Recreational shooting may negatively affect breeding burrowing owls; however, the lack of a clear relationship between recreational shooting and reproductive data in 2000 (Fig. 6) suggests that other factors were involved.

(3) Although these results were exploratory in nature and should be interpreted as such, we believe it is an important first step in assessing the role of recreational shooting.

Acknowledgements

We would like to thank the Shortgrass Steppe Long Term Ecological Research (SGS-LTER) and US Forest Service personnel for providing GIS data layers and research support. Martha B. Coleman and John B. Norman assisted with GIS database development. Patricia Kennedy, John Wiens, and Phillip Chapman offered invaluable guidance and statistical advice. Lastly, we would like to thank Judy May for allowing access to several private sites.

Contact Information

E-mail: woodie@lamar.colostate.edu