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Efficacy of Deferred Grazing in Reducing Prairie Dog Reinfestation Rates¹

Kelly A. Cable² and Robert M. Timm³

Abstract.--Population growth of black-tailed prairie dogs (*Cynomys ludovicianus*) was studied in 1985 and 1986 at 20 prairie dog towns on short- and mixed-grass rangeland in western Nebraska, to determine the efficacy of 2 years deferred (May 1 - Sept. 1) grazing in reducing population growth rates following population reduction. In 1985, population growth measures on deferred sites were not significantly different from grazed sites, perhaps due to drought conditions. In 1986, natality and population growth (% increase in animals) were significantly lower on deferred sites than on sites grazed by livestock. Deferred sites studied both years showed significant reductions in 1986 active area: 4 of 5 deferred sites decreased in size; 6 of 8 grazed sites increased in size. Results of this study suggest that deferred grazing may be effective in reducing reinfestation rates of prairie dogs following control, given favorable vegetative growth conditions.

INTRODUCTION

Historically a target of control efforts, prairie dog populations have been increasing since the institution of restrictions on the use of principal rodenticides in 1972 (Fagerstone 1982, Knowles 1982) and the cessation of federal animal damage control (ADC) activities aimed at prairie dogs. Legal control techniques typically employed to reduce prairie dog populations include poison bait application, fumigation, and shooting. Although these methods may result in immediate population reduction, they frequently do not produce a long term decrease in animal numbers for a particular site unless applied regularly. Repopulation of treated prairie dog colonies has

been a recurring problem. On western U.S. Forest Service lands, retreatment of treated colonies appears to be necessary at least every 3 years (Schenbeck 1982). The necessity of frequent retreatment, and the cost of such control methods, have sparked interest in developing other methods of prairie dog population regulation or control. This paper presents the results of a study evaluating the efficacy of 2 years of deferred (May 1 - Sept. 1) livestock grazing in reducing reinfestation rates of black-tailed prairie dogs (*Cynomys ludovicianus*) on short- and mixed-grass rangeland in western Nebraska.

BACKGROUND

In recent years, there has been increasing interest in potential ecological relationships between prairie dog population growth and large ungulate grazing. The establishment and growth of prairie dog towns appears to be favored by intensive cattle grazing (Knowles 1982). Apparently, prairie dogs thrive best in short-grass habitats, or mid- and tall-grass areas which receive heavy livestock use. Knowles (1982) suggests that prairie dogs probably cannot maintain towns in mixed-grass habitat without the influence of large ungulate grazing, except if

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sites have inherently low productivity. It is theorized that the prairie dog's visual predator detection system is aided by the maintenance of short vegetation; additionally, it is possible that prairie dogs in taller vegetation may undergo some stress factor, or may have a reduction in natality brought about by nutritional shortages or social pressures (Snell and Hlavachick 1980).

The initial work investigating prairie dog - livestock grazing relationships suggests that the removal of livestock grazing from prairie dog towns may allow enough of a release from grazing pressure to result in a response from the vegetation. The increased vegetative growth, or response, appears to have a negative impact on prairie dog populations. Knowles (1982) observed that of 3 prairie dog towns (mixed-grass range) where cattle grazing had not occurred for 7 to 10 years, one town was inactive, and two were greatly reduced in size. Uresk and Bjugstad (1983) observed a reduction in active burrow densities when cattle were excluded from pastures with prairie dogs, which they attributed to the occurrence of taller vegetation. Uresk, et al. (1982) found that burrow densities in southwestern South Dakota on sites grazed by cattle increased at twice the rate of sites not grazed. An ungrazed enclosure on a town in mixed-grass appeared to contain a prairie dog population that was heavily dependent on immigrants to maintain animal numbers (Knowles 1982).

In an uncontrolled test, a 110 acre prairie dog town in Barber County, Kansas (25 inches average annual rainfall) was reduced to 12 acres in size following 4 successive seasons of deferred (June - August) livestock grazing (Snell and Hlavachick 1982). Located on a range site with the potential for mid-grasses, only short-grasses were observed prior to deferral, due to poor range condition. Snell and Hlavachick attribute vegetative recovery to dormant rootstock present. After 8 years, this town was 0.2 acres in size (Anonymous 1984).

Recent work in mixed-grass range of western South Dakota suggests that vegetative response to a release in grazing pressure may occur at a very slow rate. Uresk (1985) found that controlling prairie dogs did not result in a positive increase in forage production after 4 years. Uresk and Bjugstad (1983) suggest that total exclusion from herbivores (cattle and prairie dogs) for 9 or more years may be required to increase forage production when range is in a low condition class. Because of the observed slow vegetative recovery, it was theorized that any potential vegetative response to deferred livestock grazing in western Nebraska might be aided by concurrently reducing prairie dog grazing pressure through population reduction.

METHODS

Twenty and 18 prairie dog towns were used as study sites in 1985 and 1986, respectively. All

of the sites were located in the short- and mixed-grass rangeland of western Nebraska (14 - 17 inches average annual precipitation). Deferral of livestock grazing was during the period of May 1 to Sept. 1; landowners were permitted to winter pasture livestock or hay deferred pastures Sept. - April. Cooperating landowners reported a range of 4 to 15 acres per animal unit month (AUM) livestock stocking rate on grazed pastures.

All of the sites had reduced prairie dog densities (1.5 - 10.9 adults/ha) through one or a combination of 3 methods applied within 2 years of the onset of the study: shooting, poison bait application, or fumigation. Three measures of population growth (increase in animal density, % increase in animals, and pup:adult ratio) were based on visual population censuses conducted in spring and late summer. Pup:adult ratio was treated as an indication of natality, and was based on the spring census. Increase in animal density and % increase in animals were based on growth in terms of the difference between the number of adult prairie dogs present on sites in spring, and the total number of prairie dogs present in late summer. These 2 population growth measures incorporate but do not discriminate between natality, immigration, emigration, and survivorship during that period. Town areas (ha) were measured in June of each year by mapping the outermost active prairie dog burrows.

RESULTS AND DISCUSSION

In 1985, no significant differences were found between treatments for any of the population growth measures (see Table 1). In 1986, 2 of the 3 population growth measures were lower for the deferred treatment than for the grazed treatment. Pup:adult ratio and % increase in animals were significantly lower on deferred sites than on sites grazed by livestock ($P > 0.06$ and $P > 0.02$, respectively). Statistical comparisons of population growth measures between years of the study are probably not valid, because environmental conditions affecting prairie dog populations varied considerably. However, examination of mean growth values (Table 1) reveals that all 3 population growth measures increased from 1985 to 1986 on grazed sites, whereas all growth measures decreased on deferred sites. Precipitation received at study sites did not differ significantly between treatments, but did differ between study years ($P > |t| = 0.001$). 1985 was a dry year in the Nebraska Panhandle, and some study sites received as little as 55% of the normal rainfall. 1986 was a much wetter year, with many study sites receiving normal or slightly above average rainfall.

Change in town size is a growth measure of interest to landowners, who may equate extent of damage with extent of colony area. However, change in town size does not necessarily reflect degree of damage to rangeland vegetation, which may vary with prairie dog density, and does not necessarily reflect other measures of population

Table 1.--Population growth values.

Population growth measure	Year	N	Trt.	\bar{X}	S.D.	Range
Increase in animal density	1985	8	D ¹	9.9	9.7	0.0 - 26.9
Increase in animal density	1986	8	D	6.6	6.6	0.0 - 17.2
Increase in animal density	1985	12	G ²	5.7	4.6	1.6 - 13.8
Increase in animal density	1986	9	G	8.9	4.5	3.3 - 17.0
% Increase in animals	1985	8	D	148.8	88.4	0.0 - 259.0
% Increase in animals	1986	8	D	87.0	80.9	0.0 - 242.0
% Increase in animals	1985	12	G	152.6	97.3	82.0 - 416.0
% Increase in animals	1986	9	G	179.6	88.3	67.0 - 363.0
Pup:Adult ratio	1985	8	D	2.2	1.0	1.0 - 3.7
Pup:Adult ratio	1986	8	D	1.4	0.9	0.1 - 2.4
Pup:Adult ratio	1985	12	G	1.8	1.1	0.0 - 4.2
Pup:Adult ratio	1986	9	G	2.1	0.9	0.7 - 3.8

¹D = deferred
²G = grazed

growth. Active areas of sites ranged from 0.4 to 20.3 ha. Active areas for deferred treatment sites decreased significantly from 1985 to 1986 ($P>t=0.07$): 4 of the 5 deferred treatment sites used in both years of the study decreased in area inhabited by prairie dogs, with a mean decrease on the 4 declining towns of 49%, and mean overall change in size of the deferred treatment towns of -37%. Conversely, 6 out of 8 grazed sites increased in active area ($P>t=0.04$), with a mean increase on the 6 expanding towns of 42%, and mean overall change in size of grazed treatment towns of +25%.

A decrease in area inhabited by prairie dogs does not necessarily imply a decrease in prairie dog numbers or density: town contraction may result in a net increase in density. One study site decreased 51% in active area from 7.2 ha in 1985 to 3.5 ha in 1986. However, number of spring adult prairie dogs increased from 12 (1.7 adults/ha) in 1985 to 21 (6.0 adults/ha) in 1986, a net increase in animals of 43% and a net increase in density of 253%. Knowles (1982) observed a 47% increase in acreage over a 2 year period, with a concurrent decline in density of 30.6 to 19.6 prairie dogs/ha. Knowles noted the change in density appeared to be correlated ($r^2=0.85$) with precipitation: two dry years occurred with low vegetative production, and the prairie dogs expanded into adjacent, abandoned areas. Rainfall would not appear to be the sole controlling factor in western Nebraska, because precipitation did not differ significantly between expanding and nonexpanding towns. However, the combined influence of rainfall and livestock grazing on vegetation may have contributed to changes in town area. Low 1985 precipitation and livestock grazing and trampling would tend to result in low height and density of grazed-site vegetation, and encourage expansion by prairie

dogs into adjacent areas. Absence of livestock grazing on deferred sites, in combination with high 1986 precipitation, may result in greater vegetative height and density on deferred sites, and discouragement of prairie dog expansion.

Visual observations on deferred treatment sites suggest that as town area contracts, prairie dog activities become less generally distributed across colonies, and clumps, or centers of activity result. These clumps of prairie dogs appear to be separated by relatively taller, sparse vegetation.

MANAGEMENT IMPLICATIONS

Results from this study suggest deferred grazing may be an effective management tool in reducing prairie dog reinfestation rates. The efficacy of deferred grazing in the mixed- and short-grass rangeland of western Nebraska would appear to be heavily dependent on rainfall. Below average rainfall would appear to limit vegetative response to a release from grazing pressure, and result in prairie dog population growth rates similar to those seen on sites with higher grazing pressure. The efficacy of deferred grazing would also be expected to vary with the natural productivity capacity of specific sites.

Within the constraints of the study (i.e. town size 0.4 - 20.3 ha; 1.5 - 23.6 adults/ha), colony size and initial prairie dog density would not appear to reduce the efficacy of deferred grazing in reducing population growth rates of prairie dogs. However, large towns and prairie dog densities more typical of uncontrolled towns were not studied. The ability of high prairie dog densities to limit potential vegetative response to removal of livestock grazing pressure may

exist. If so, the application of deferred grazing is probably most efficacious as a method of reducing population growth when applied soon after population reduction.

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