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SELECTIVE USE OF BLACK-TAILED PRAIRIE DOG TOWNS BY MOUNTAIN PLOVERS

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ABSTRACT.—Habitat use by Mountain Plovers (*Charadrius montanus*) was studied in north-central Montana during 1978 and 1979. Mountain Plovers were found to selectively inhabit black-tailed prairie dog (*Cynomys ludovicianus*) towns. Horizontal visibility and bare ground were significantly greater inside prairie dog towns used by plovers than adjacent areas. Total plant cover and grass cover were significantly lower inside prairie dog towns than on adjacent areas. Most towns on the study area were associated with an area that was intensively grazed by cattle. Plovers used only the active towns larger than 3 ha located on level upland sites (n = 16 out of 35).

The ecology and behavior of the Mountain Plover (*Charadrius montanus*) have been studied in southeastern Wyoming and northeastern Colorado (Laun 1957; Baldwin 1971; Graul 1973a, b, 1974, 1975; Graul and Webster 1976). None of these reports mention Mountain Plovers using prairie dog towns. Cameron (1907) found these plovers to be associated with prairie dog towns in southeastern Montana. Black-tailed prairie dog (*Cynomys ludovicianus*) towns occupy level sites, are intensively grazed by cattle, and have short vegetation. Prairie dog towns represent a distinctive habitat in this region and also are used by Horned Larks (*Eremophila alpestris*), Killdeer (*Charadrius vociferus*), and Burrowing Owls (*Athene cunicularia*). The purpose of our study was to investigate the association of Mountain Plovers with prairie dog towns, and to describe related habitat characteristics.

STUDY AREA AND METHODS

Our study area, comprising 560 sq km on the north side of the Missouri River, was 100 km southwest of Malta in Phillips County, Montana on the Charles M. Russell National Wildlife Refuge (CMR; Fig. 1). It is within the timbered breaks of the river and is characterized by alternating deep-cut coulees and steep-sided ridges. Major ridgetops are broad and flat, becoming progressively wider with increasing distance from the river. Ponderosa pine (*Pinus ponderosa*) and Rocky Mountain juniper (*Juniperus scopulorum*) dominate slopes with northerly exposures. The dominant plant species on the level ridgetops are western wheatgrass (*Agropyron smithii*), blue grama (*Bouteloua gracillis*), prickly pear (*Opuntia polycantha*), fringed sagewort (*Artemisia frigida*), and big sagebrush *A. tridentata*). Knowles (1975) described fully the vegetation of this area. The mean annual precipitation and temperature are 35 cm and 6.6°C.

To obtain distributional data on Mountain Plovers, we established a system of 18 vehicular transects throughout the study area (Fig. 1). Nine of the transects, totalling 19.2 km, were in prairie dog towns, and nine others, totalling 18.5 km, were outside of towns. The route was run 10 times, generally in the morning, at approximately one-week intervals from 1 June to 8 August 1979 using a three-wheeled "all-terrain" motorcycle. Cruising speed along the transects was 15 km/h; we stopped only to record observations of Mountain Plovers visible from the vehicle. A chi-square test of homogeneity was used to test the hypothesis that numbers of plovers within and outside of towns were homogeneous.

Horizontal visibility within and adjacent to six prairie dog towns used by Mountain Plovers was measured with a coverboard 2 m high, 1 dm wide and divided in 1 dm intervals. One transect was placed inside and one adjacent to each of the six towns. Each visibility transect consisted of two parallel, 150-m lines spaced 60 m apart. Six stakes were placed along each line at 30-m intervals. Coverboard sightings were taken from each stake along one line perpendicular to the corresponding stake on the opposite line, and diagonally to the closest stake left and/or right of the corresponding stake (stake 1, line A to stake 2, line B, etc). This scheme allowed 16 measurements per transect. Eye level for the sightings was at 1 m and visibility was estimated to the nearest 5%. A Mann-Whitney *U*-test was used to test

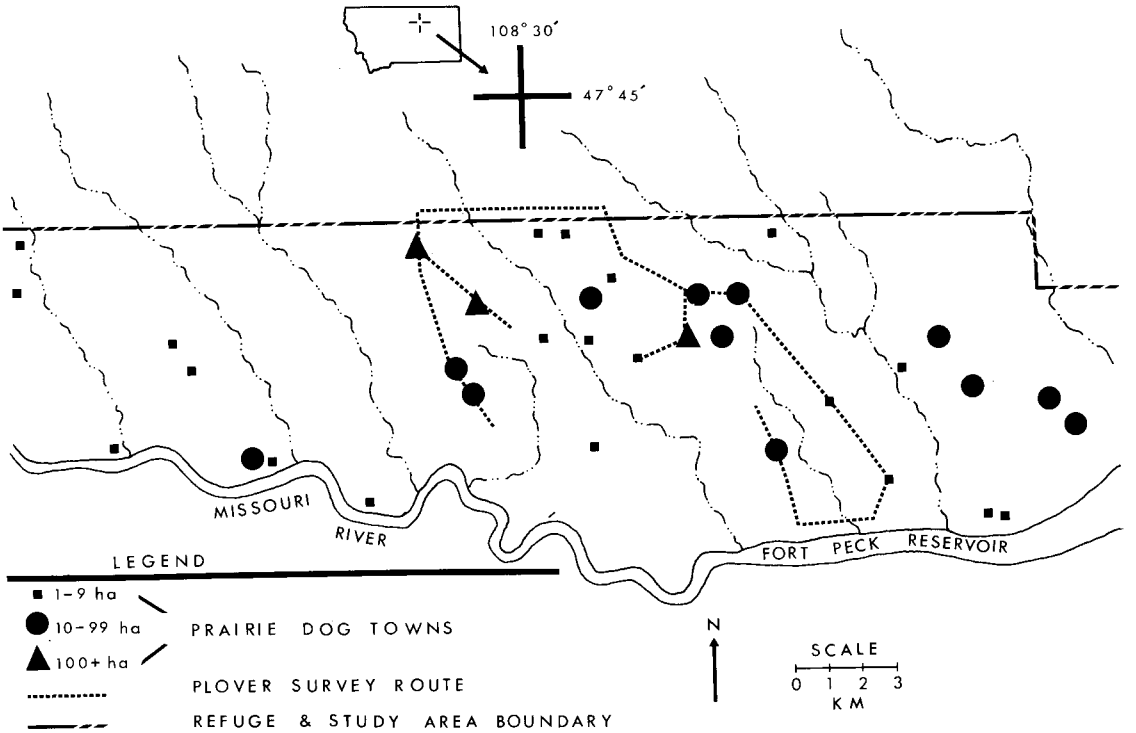

FIGURE 1. Map of study area showing Mountain Plover census route and prairie dog towns.

the hypothesis that the median visibility value within prairie dog towns was equal to that outside of prairie dog towns. Similar visibility transects were also established at four towns in bottomland sites not used by plovers. At each stake along all of these visibility transects, slope was measured with a slope meter similar to that described by Koeppl (1979).

Amount of bare ground and canopy coverage (Daubenmire 1959) of litter, total plant cover, grasses, forbs, and shrubs were determined inside and adjacent to five prairie dog towns used by Mountain Plovers. One transect was placed inside and one adjacent to each of the towns. Each transect consisted of five parallel 30-m lines spaced 15 m apart. Ten 2 × 5 dm plots were sampled at 3-m intervals along each line. A Mann-Whitney *U*-test was used to test the hypothesis that median cover values inside prairie dog towns were equal to median cover values in adjacent areas.

RESULTS

We recorded 91 Mountain Plovers during the 10 survey runs; 90 of these were in prairie dog towns. Association with prairie dog towns was highly significant ($P < 0.005$). The plover seen outside of a town during the surveys, plus two seen outside of towns during May, were single birds within 0.5 km of a town on level, sparsely vegetated sites with considerable amounts of bare ground. During July and August 1979, we recorded sightings of plovers in conjunction with other work in the study area, and all 71 birds seen were in prairie dog towns. We found three nests of plovers in towns during May; broods were frequently observed in towns during June and July. We also found that plovers could not be readily chased out of towns. When pursued on foot they would run in front of us up to the boundary of the town and then fly a circuitous route back into the town. Plovers also roosted in towns at night. In 1979, Mountain Plovers were in prairie dog towns from 3 April to 21 August.

Horizontal visibility within prairie dog towns used by Mountain Plovers was significantly ($P < 0.001$) greater than visibility adjacent to these towns (Fig. 2). The amount of bare ground and coverage of forbs was greater in towns than adjacent areas but the difference was significant ($P < 0.05$) only for bare ground. Coverage of litter, total plant cover, and grass were less in towns as compared to adjacent areas; only the latter two were significant ($P < 0.05$ and $P < 0.025$, respectively). Shrubs accounted for less than 1% coverage at all sites except one, where big sagebrush covered 28% of the ground adjacent to a town. All slopes recorded along the visibility transects inside

of towns were less than 12%. In general, prairie dog towns and the surrounding areas were very level; this was especially true of towns located on upland sites. In several of the towns used by plovers, small areas had slopes of 12%–25%; occasionally plovers were seen on these slopes.

Thirty of the 35 prairie dog town sites that occurred on the study area were active in 1979. Plovers were seen at 16 of the active towns and at none of the inactive towns. Half of the active towns were larger than 10 ha, while 81% of the towns used by plovers were larger than 10 ha ($\chi^2 = 6.25$, $P < 0.025$). The smallest town in which a plover was found was 3 ha. We did not find Mountain Plovers in any of the six town sites that were located on the bottomlands of the Missouri River and its tributary coulees. Towns in the bottomland sites were smaller ($\bar{x}$, 4.8 vs. 29.3 ha) and had lower visibility values ($\bar{x}$, 78 vs. 96%) than those on upland sites. Most (83%) of the towns on this study area were associated with intensive grazing by cattle or with some other physical disturbance. Fourteen of the 16 prairie dog towns used by plovers were located next to stock ponds. The other two towns were more than 1 km from a stock pond, but cattle were frequently seen loafing and feeding in one of the towns. All towns used by plovers were grazed by cattle, while stock pond sites without prairie dogs were not used by plovers. Many of the towns were closely associated with one or more other towns, and during late August 1978 two small flocks of plovers were seen flying between closely associated towns. Also, during August 1979, plovers used a town that they had not used earlier in the year. Thus, at least during August, there was some interchange of plovers between towns.

Larger prairie dog towns usually contained more than one pair of plovers. An intensive search in May 1979 of a 100-ha town revealed at least 13 adult plovers. We considered the density of Mountain Plovers in this prairie dog town to be representative of that which we encountered in other large towns.

DISCUSSION

The data from the census routes and our general observations both show that Mountain Plovers selectively inhabit prairie dog towns on the CMR. These towns furnished the necessary habitat for plovers from their arrival in April until their departure in August; breeding, rearing of young, feeding, and roosting all appear to take place in prairie dog towns. Plovers may be responding to differences in vegetative cover, plant species composition, topography, and/or food availability in selection of towns over areas not occupied by prairie dogs.

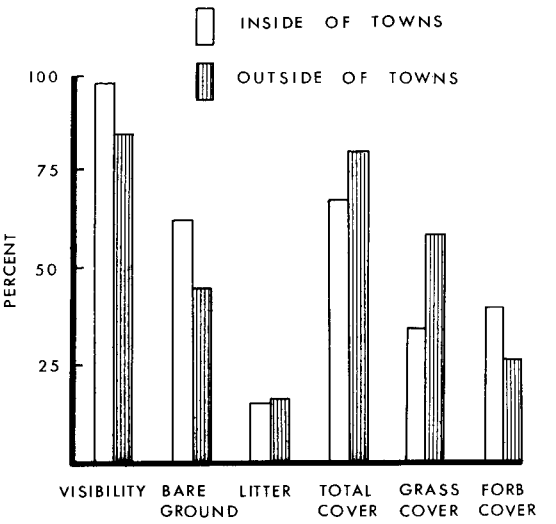

FIGURE 2. Horizontal visibility, bare ground, and canopy coverage of litter, total plant cover, grass cover and forb cover inside of and adjacent to prairie dog towns used by Mountain Plovers.

Mountain Plovers were associated with the larger prairie dog towns in upland areas. Towns less than 10 ha were marginal sites for plovers to raise young successfully as no young were sighted in the three towns used in this category. Although most towns used by plovers were next to stock ponds, the presence of plovers at two towns without water suggests that they can survive without a source of free water. Others (Bradbury 1918, Laun 1957) have reported that Mountain Plovers nest in areas remote from free water.

Towns used by plovers were very level with slopes rarely exceeding 12% (see also Graul 1975). Mountain Plovers in Colorado occur with greatest densities in areas with short grass, level topography, and intensive livestock grazing (Graul and Webster 1976). The towns on our study area offered an excellent combination of these three factors.

Our study provides evidence that Mountain Plovers live commensally with herbivorous mammals. Plovers were always found in intensively grazed areas. Here, near the northern limits of the present range of Mountain Plovers (Graul and Webster 1976), the combined effects of prairie dogs and cattle on the vegetation are apparently needed to provide suitable nesting conditions for the birds. Plovers were not found in areas of intensive grazing without prairie dogs, and prairie dogs were dependent on cattle for conditions to successfully establish a town. The plovers cope with approaching grazing ungulates by flying at their faces in order to divert them from nesting areas (Walker 1955, Graul 1975).

Graul and Webster (1976) found the density of nesting Mountain Plovers in Colorado to range from 4 to 32 birds per sq km with about 20 birds per sq km being most representative. The density (13 plovers per sq km) that we found in one of the larger towns on the study area is lower than what Graul and Webster (1976) considered average for northeastern Colorado. Prairie dog towns occupied only 1.6% of our study area, and overall densities probably did not exceed 0.2 birds per sq km.

Skaar (1980) listed Mountain Plovers as breeding in five areas in Montana, and he listed another eight areas as showing "circumstantial evidence for breeding." However, a recent state-wide survey of non-game mammals and birds found plovers breeding only in Phillips County (Flath, pers. comm.), which includes two of the breeding areas listed by Skaar (1980). Bureau of Land Management records show that plovers are found in prairie dog towns throughout the south half of Phillips County (Shryer, pers. comm.). These records also include a sighting of two plovers in a town immediately south of our study area. Dood (1980) noted a plover in a prairie dog town in Custer County, Montana in August 1979 but considered it to be a migrant. In Montana, breeding populations of Mountain Plovers now appear to be confined to prairie dog towns in the north-central part of the state. The decline of Mountain Plovers in Montana may be related to the near-extermination of prairie dogs earlier in the century (Koford 1958).

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