Micro-Habitat Characteristics of Mountain Plover Nest Sites

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Abstract
This study was conducted on shortgrass prairie in northeast Colorado to determine micro-habitat characteristics of nest sites for mountain plover (*Charadrius montanus Townsend*). Vegetation and soil surface characteristics were sampled in the spring of 1996-97 at and near 16 nests to identify important micro-habitat characteristics for site selection. We collected data on plant structure and canopy cover near nests in the spring during 2 years. Mean bare ground within a 15 m radius of the nest was 24 percent and bare ground patch size was 29 cm^2. Mountain plovers selected nest sites that had short plant structure and a mean visual obstruction reading (VOR) of 0.6 cm. Plant structure (VOR) from 4 m to 15 m was significantly greater than structure at 0 to 2 m from the nest.

Key words: mountain plover, grazing, habitat, plant height, soil surface, visual obstruction.

Introduction

The mountain plover (*Charardrius montanus*) is found on level sites with sparse, short vegetation throughout most of its range (Olson and Edge 1985). Bradbury (1918, page 157) described a mountain plover nesting area 20 miles east of Denver as cattle range "…covered with short-cropped buffalo or grama grasses with frequent bunches of dwarfed prickly pear, and an occasional cluster of stunted shrub or weed…". Graul (1975) found most mountain plover nest sites in Weld County, Colorado in shortgrass areas of blue grama (*Bouteloua gracilis*) and buffalograss (Buchloe dactyloides) with scattered clumps of plains prickly pear (*Opuntia polyacantha*) and western wheatgrass (*Pascopyrum smithii*). There is little information focusing specifically on the micro-site characteristic of mountain plover nest sites. The mountain plover was originally proposed as threatened or endangered according to the Endangered Species Act of 1973 in 1999 (Federal Register 2011)in 2002 but was withdrawn from consideration in 2003. In 2010, the mountain plover was again proposed as a threatened species. The proposal to list the mountain plover as a threatened species was withdrawn May 12, 2011. It was determined that the mountain plover was not threatened or endangered throughout all or a significant portion of its range. Though not listed as an endangered species the, mountain plover should receive continued surveillance just to maintain existing populations. The purpose of this study was to determine nest selectivity of mountain plovers by assessing and describing vegetation and soil surface characteristics at, and directly surrounding mountain plover nests in Colorado.

Study Area

The study area was in northeastern Colorado near Keota in Weld County and within the Pawnee National Grassland., The grassland encompasses 78,162 ha of publicly owned tracts of and intermingled with privately owned farms and ranches. The area is classified as a shortgrass steppe; blue grama, buffalograss, plains prickly pear, western wheatgrass, and sun sedge (*Carex inops*) are the principal plant species (USDA NRCS 2004). Other plant species present included woolly plantain (*Plantago patagonica* Jacq.), rubber rabbitbrush

(*Ericameria nauseosa* [Pall. ex Pursh] G.L. Nesom & Baird), sixweeks fescue (*Vulpia octoflora*), and fourwing saltbush (*Atriplex canescens*). The soil type in the study area is an Ascalon-Vona sandy loam, a deep well-drained Ustollic Haplargid (Crabb 1982).

Methods

Mountain plovers, in a preliminary search of the study area, were most frequently found on loamy plains range sites with less than 2 percent slope and a southern to southwestern aspect in the study area. We selected 8 sites with these attributes that were 1.6 to 15 kilometers apart and roughly 500 ha in size to search for plover nests. Searching for individual plovers began at sunrise and continued through sunset during the nesting period. Once a plover was located, it was observed until it settled on the nest. The nest was then located and data collected within a very short time. We initially searched the selected sites for mountain plover nests in spring, 1996. Because so few nests were found on the 8 study sites in the spring of 1996, we expanded the search in 1997 to include larger areas outside the original study sites that were potentially good mountain plover habitat.

We measured vegetation height-density (density of leaf mass at various heights determined by visual obstruction readings on a Robel pole) and cover along 15 m transects radiating outward in the 4 cardinal directions from each nest during the nesting period. We recorded the height-density or visual obstruction reading (VOR) of vegetation for each nest site using a modified Robel pole as described by Uresk and Benzon (2007) and Uresk and Juntti (2008). The modified pole had alternating 1.27 cm white and gray rings. Bands were numbered beginning with 0 (white band) at the bottom and the pole was placed on the soil surface. A (VOR) was taken from a distance of 4 m from the pole for each of the four cardinal directions. The lowest visible band was recorded. Visual obstruction readings were recorded at the nest site and at points 10 and 15 m from the nest along each of the four transects. Because 1996 data showed significant differences between the nest and 10 m station, we added additional sample stations at 2, 4, 6, and 8 m from the nest along the transects in 1997 in an attempt to more precisely describe the vegetation zone around the nest.

Canopy cover by major plant species, total grasses, total forbs, total plants and bare ground (Daubenmire 1959) and soil surface characteristics (percent bare ground and bare ground patch size) were estimated within 20 x 50 cm quadrats positioned at 1 m intervals along each of the four 15 m transects. Bare ground patch size within each quadrat was classified into 1 of 6 class codes (Table 1). Mid points of class codes were used to estimate patch size (cm^2) following methods described by Daubenmire (1959).

Table 1. Class codes (1-6) with corresponding size of bare ground patches. Mid points of patch size were used to estimate area (cm^2).

Class codes	Bare ground patch size (cm^2)
1	0 - 3.2
2	3.3 - 12.6
3	12.7 - 28.3
4	28.4 - 50.3
5	50.4 - 78.6
6	>78.6

VOR data at the nest site and along the transects at various distances (meters) were analyzed with a General Linear Model repeated measures design (SPSS, 2003) for both years. The Bonferroni pairwise comparisons test was used to determine significance differences between VORs at the nest site and at distances from the nest. We used a two sample T-test to compare differences between years for canopy cover variables and patch size at $p = 0.10$.

Results

Sixteen nests were located during the 2 years of sampling: 6 in 1996 and 10 in 1997. Mean VOR at time of nesting for 6 nest sites in 1996 was 0.9 cm ± *SE* 0.3 and for 10 nest sites in 1997 VOR was 0.3 ± *SE* 0.2. Bare ground, bare ground patch size, and canopy cover of major plants and categories within the 15 m radius of the nest is shown

in Table 2 for both years. Differences (p = 0.10) were observed between years for blue grama, total cover and total graminoids with 1996 providing greater canopy cover than in 1997. Overall, bare ground was 24% ± SE 2%, bare ground patch size 29 cm^2 ± *SE* 3cm, total plant cover 69% ± *SE* 3%, total graminoides 67% ± *SE* 3% and total forbs 4% ± *SE* < 1%.

VOR was greater at stations away from the nest. For combined years, mean VOR at the nest station (0.06 ± *SE* 0.2 cm) was significantly less than VOR at both 10 m (1.8 ± 0.3 cm) and 15 m stations (2.0 ± 0.3 cm)) (p = 0.05). In 1997, VOR's estimated at 10 nests sites and at 2 m away from the nest were similar (Fig. 1, p > 0.10). However, mean VOR at the 4 m station and beyond to the 15 m were similar but significantly greater than at or less than 2 m of the nest p = 0.10 (Fig. 1).

Discussion

Mountain plovers prefer areas that have been intensively grazed by livestock and avoid areas of vegetation greater than 0.5 cm high for nesting (Graul and Webster 1976; Leachman and Osmundson 1990). Micro-site characteristics were important to mountain plovers nesting on the Pawnee National Grassland. With a refinement of the sampling design in 1997, the zone of greatest influence was shown to be a distance of about 2 m compared to distances from 4 through 15 m from the nest. Once an area had been selected for a breeding territory, the vegetation structure, cover, and amount of bare ground were important characteristics of the actual nest site location by mountain plovers.

Visual obstruction readings at the nest site were slightly greater (0.57 cm) in our study in Colorado compared to values (0.13 cm) reported by Parrish et al. (1993) in Wyoming. In Colorado on shortgrass prairie, plover nests were found in blue grama, buffalograss, and western wheatgrass grazed by cattle. Nesting sites were located in areas with 24 percent bare ground distributed in an average patch size of 29 cm^2. Olson and Edge (1985) reported 27 % bare ground (erosion pavement) for nest sites in Montana. However, Parrish et al. (1993) and Plumb et al. (2005) reported

Table 2. Vegetation and soil surface characteristics measured within a 15 m radius of Mountain Plover nests on the Pawnee National Grassland for years 1996-1997 and years combined for 16 nest sites.

Plant species	Mean ± SE (n = 6) 1996 %	Mean ± SE (n = 10) 1997 %	Mean ± SE (n=16) 1996-1997 %
Pascopyrum smithii	8.0 ± 3.2[a]	5.7 ± 2.4	6.6 ± 1.9
Bouteloua gracilis	23.0 ± 7.1 *	41.5 ± 5.9	34.6 ± 5.0
Buchloe dactyloides	38.3 ± 3.6	22.9 ± 7.9	28.7 ± 5.4
Opuntia polyacantha	6.5 ± 1.7	8.7 ± 1.9	7.9 ± 1.3
Total cover[b]	76.8 ± 1.7 *	63.7 ± 3.6	68.6 ± 2.8
Total graminoids	76.3 ± 1.6 *	53.1 ± 6.7	67.2 ± 2.8
Total forbs	4.3 ± 1.3	3.8 ± 0.3	4.0 ± 0.5
Bare ground	21.8 ± 2.4	26.0 ± 2.7	24.4 ± 2.0
Bare ground patch size (cm^2)	25.7 ± 3.8	30.6 ± 3.9	28.8 ± 2.8

[a] Standard error

[b] Two dimensional cover that does not include the sum of individual species.

* Significantly different between years at p = 0.10

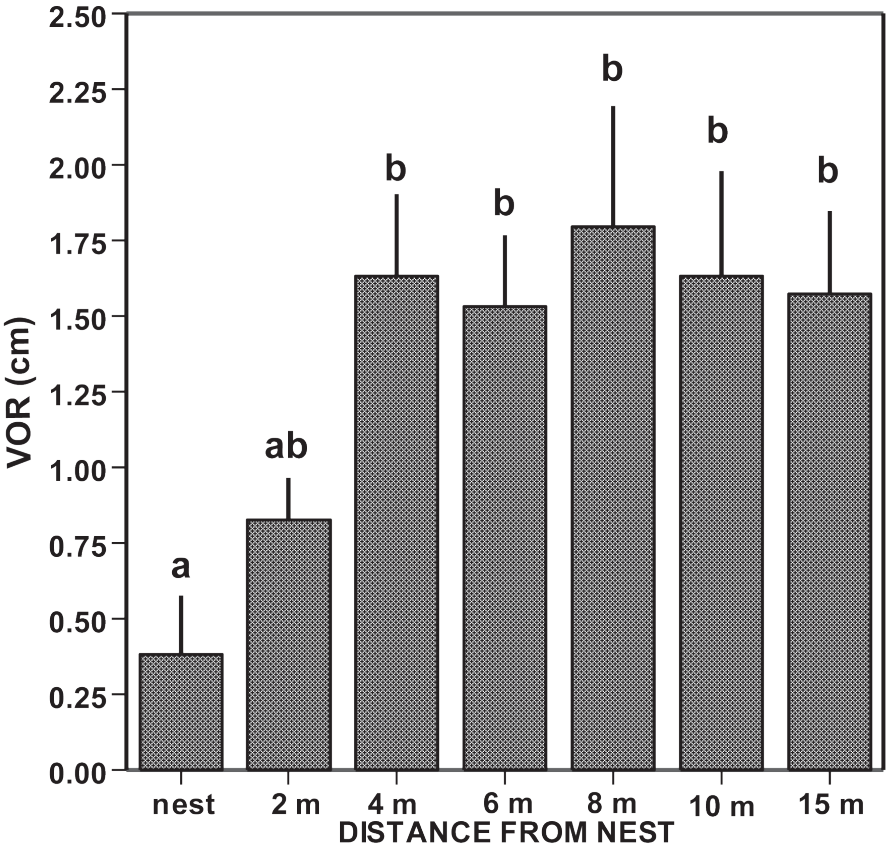

Fig. 1. Visual obstruction readings (VOR) at different distances away from mountain plover nests (n = 10) in Colorado for 1997. Different letters above the bars represent differences among the distances (m) at p = 0.10 with standard errors.

nesting at areas of 72% and 47% bare ground, respectively, on grasslands in Wyoming.

Livestock grazing has been used as a tool for wildlife habitat management (Severson 1990). Grazing management can be an important and perhaps less expensive tool than mowing or prescribed fire for creating or maintaining mountain plover nesting habitat. Prairie dog colonies are important for plover nesting and should receive a high management priority: however, managing and maintaining prairie dog colonies is difficult with continued outbreaks of plague and rodenticide poisoning on the plains (Miller et al. 2007). Grazing management plans related to the amount of herbage remaining after livestock grazing are generally designed for optimal livestock or plant production and often result in homogeneous vegetation structure. To create or maintain optimal mountain plover habitat, grazing intensity should be heavy during fall, winter and early spring. Livestock grazing provides managers with some control for creating favored plover habitat. Creating vegetation areas with VORs with a mean of 0.6 + *SE* 0.2 cm with livestock grazing could provide conditions of height-density structure and patchiness for attracting plovers.

Mountain plovers use grasslands with low canopy cover, high percentage of bare ground and low visual obstruction near nests. Target conditions for optimal nesting habitat for mountain plovers include less than 70 percent total vegetation canopy cover , bare ground of 24 percent or greater and visual obstruction readings of vegetation with averages ranging from 0.3 to 0.9 cm.

Prairie dog colonies and heavy livestock grazing in late fall, winter or early spring provide preferable mountain plover habitat. These guidelines should be beneficial and effective in keeping the mountain plover from being proposed as a threatened or endangered species

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Literature cited

Bradubury, W. C. 1918. Notes on the nesting of the Mountain Plover. Condor 20:157-163.

Crabb, J. A. 1982. Soil Survey of Weld County, Colorado, Northern Part. USDA, Soil Conservation Service.

Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.

Federal Register 2011. Endangered and threatened wildlife and plants; withdrawal of the proposed rule to list the mountain plover as threatened; proposed rule. Part II Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17. Vol 76, No. 92. May 12, 2011.

Graul, W. D. 1975. Breeding biology of the Mountain Plover. Wilson Bulletin 87:6-31.

Graul, W. D. and L. E. Webster. 1976. Breeding status of the Mountain Plover. Condor 78:265-267.

Leachman, B. and B. Oamunsaon 1990. Status of the mountain plover: A literature review. Unpub. Man. Prepared for the U.S. Fish and Wildlife Serv., Golden, Colo. 82 pp.

Miller, B. J, R. P. Reading, D. E. Biggins, J. K. Detling, S. C. Forrest, J. L. Hoogland, J. Javersak, S. D. Miller, J. Proctor, J. Truett, and D. W. Uresk. 2007. Prairie dogs: an ecological review and current biopolitics. Journal of Wildlife Management 71:2801-2810.

Olson, S. L. and W. D. Edge. 1985. Nest site selection by Mountain Plovers in north-central Montana. Journal of Range Management 38:278-280.

Parrish, T. L., S. H. Anderson, and W. R. Oelkluas. 1993. Mountain Plover habitat selection in the Powder River Basin, Wyoming. Prairie Naturalist 25:219-226.

Plumb, R. E., S. H. Anderson, and F. L. Knopf. 2005. Habitat and nesting biology of Mountain Plovers in Wyoming. Western North American Naturalist 65:223-228.

Severson, K. E. 1990. Can livestock be used as a tool to enhance wildlife habitat? 43rd Annual meeting of the Society for Range management, Reno, Nevada, 13 February 1990. K. E. Severson, Technical Coordinator. USDA, Forest Service. GTR RM-194.

[SPSS] Statistical Procedures for Social Science. 2003. SPSS 12.0 for Windows. SPSS, Inc. Chicago, Illinois, USA.

Uresk, D. W. and T. A. Benzon. 2007. Monitoring with a modified Robel pole on meadows in the central Black Hills of South Dakota. Western North American Naturalist 67:46-50.

Uresk, D.W. and T.M. Juntti. 2008. Monitoring Idaho fescue grasslands in the Big Horn Mountains, Wyoming, with a modified Robel pole. Western North American Naturalist 68:1–7.

USDA-NRCS. 2004. Ecological site description. R067BY002CO. Central High Plains, Southern Part. Technical Guide Section IIE, MRLA 67-Loamy.

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