(9)

THE SOUTHWESTERN NATURALIST 51(2):191–196 JUNE 2006

NEST SUCCESS OF MOUNTAIN PLOVERS RELATIVE TO ANTHROPOGENIC EDGES IN EASTERN COLORADO

CHRISTIAN W. METTENBRINK, VICTORIA J. DREITZ,* AND FRITZ L. KNOPF

Colorado State University, Colorado Natural Heritage Program, 8002 Campus Delivery, Fort Collins, CO 80523 and Colorado Division of Wildlife, 317 Prospect Road, Fort Collins, CO 80526 (CWM, VJD)
United States Geological Survey, 2150 Centre Avenue, Building C, Fort Collins, CO 80526 (FLK)
Present Address of CWM: Colorado Division of Wildlife, 6060 Broadway, Denver, CO 80216
**Correspondent: Victoria.Dreitz@state.co.us.*

ABSTRACT—We monitored nest success of mountain plovers (*Charadrius montanus*) relative to distance from the nearest anthropogenic edges, such as fence lines, roads, and perimeters of crop fields, in 2003 and 2004. We located and observed 163 mountain plover nests in eastern Colorado (USA). At least one egg hatched in 81 of 163 nests. Successful nests occurred at a mean distance of 93.94 m ± 8.87 *SE*, whereas unsuccessful nests were located 84.39 m ± 8.95 *SE* from the nearest edge. Based on our model selection criteria (AIC_c), nests farther from edges were not necessarily more successful than those closer to edges. The logistic regression coefficient for edge effects (0.13 ± 0.12 *SE*) suggests that nests farther from edges are more successful. However, the standard error for the edge coefficient was large and the 95% confidence interval (−0.08, 0.35) encompassed zero, suggesting nest success was independent of distance from an anthropomorphic edge. We conclude that phenomena determining nest success of mountain plovers cannot be attributed to the single factor of anthropogenic edges in this fragmented landscape.

RESUMEN—Observamos el éxito de nidificación del chorlo llanero (*Charadrius montanus*) con relación a la distancia de los bordes antropogénicos tales como cercas, caminos, y límites de campos sembrados en 2003 y 2004. Localizamos y observamos 163 nidos del chorlo en el este de Colorado (USA). Por lo menos un huevo eclosionó en 81 de 163 nidos. Los nidos exitosos ocurrieron a una distancia media de 93.94 m ± 8.87 *EE*, mientras que los nidos fracasados fueron localizados a 84.39 m ± 8.95 *EE* del borde más cercano. Basado en nuestros criterios de selección de modelos (AIC_c), los nidos más lejos de los bordes no fueron necesariamente más exitosos que los más cercanos a los bordes. El coeficiente de regresión logístico para efectos de borde (0.13 ± 0.12 *EE*) sugiere que los nidos más lejos de bordes son más exitosos. Sin embargo, el error estándar para el coeficiente de borde fue grande y el intervalo de confianza del 95% (−0.08, 0.35) incluyó el cero, sugiriendo que el éxito del nido fue independiente de la distancia al borde antropogénico. Concluimos que los fenómenos que determinan el éxito de nidificación del chorlo no pueden ser atribuidos sólo al factor antropogénico de los bordes en este paisaje fragmentado.

Fragmented landscapes contribute to the decline of many avian species across a wide range of habitats (Knopf, 1994; Rappole and McDonald, 1994; Warner, 1994; Askins, 1995; Peterjohn and Sauer, 1999; Murphy, 2003). These declines, especially of grassland birds, have led to various studies of the impact of fragmentation on nest success, especially relative to predation rates on eggs and nestlings near habitat edges ("edge effects"). Some of those studies have found increased predation near edges (Burger et al., 1994; Paton, 1994; Yosef, 1994; Keyser, 2002), whereas other studies have inconsistent findings or no significant impact by predation on nest survival in relation to distance from the habitat edge (Vickery et al., 1992; Keyser et. al., 1998; Howard et. al., 2001; Woodward et al., 2001). These conflicting results probably reflect differing experimental designs (Paton, 1994) and differing vegetative landscapes among studies.

Most research on the impact of edge effects on avian nest success has focused on habitat types such as fragmented forests, with some research in midgrass to tallgrass prairie systems; few studies have examined this relationship in

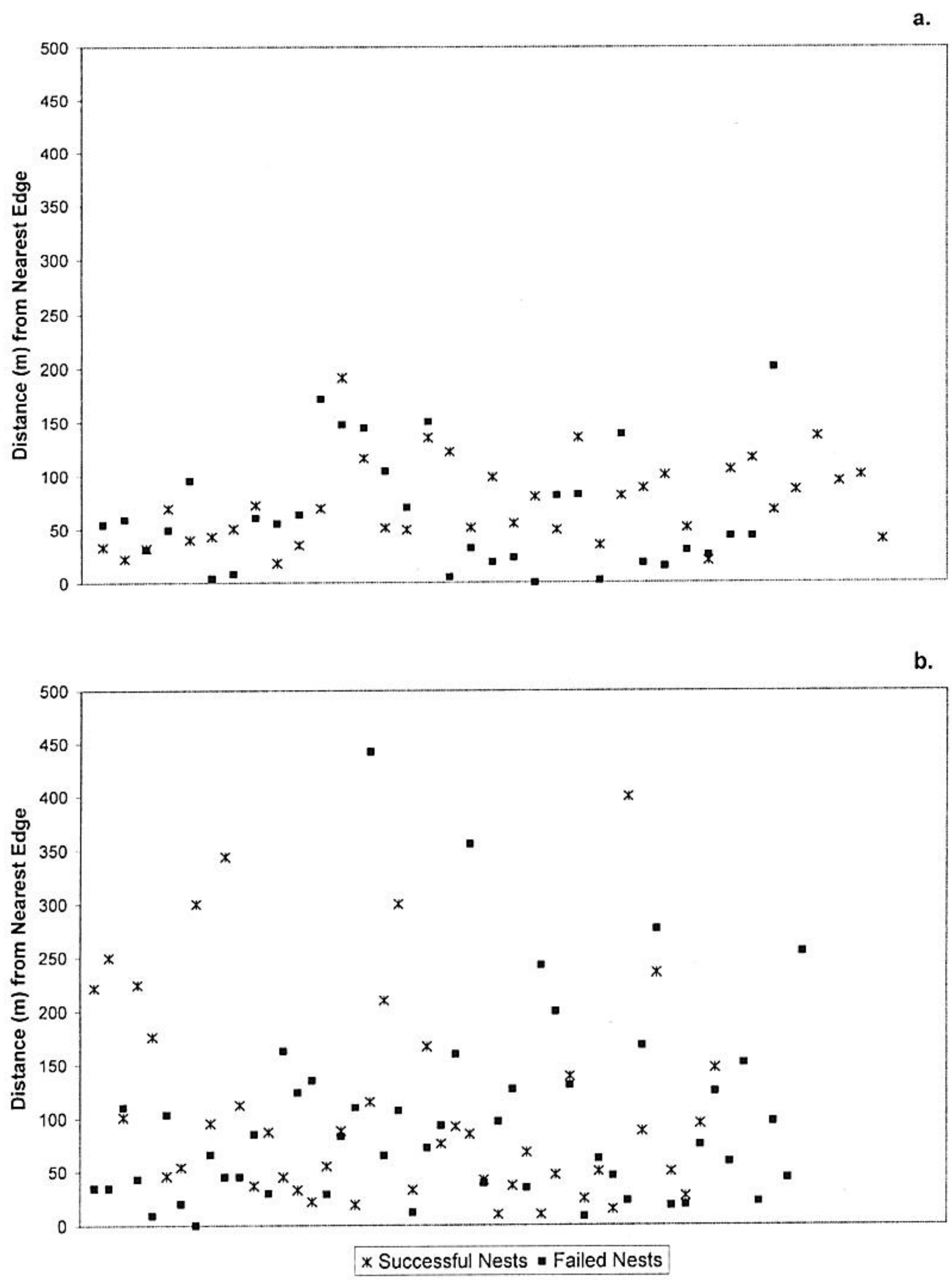

FIG. 1—Nest success of mountain plovers (*Charadrius montanus*) relative to distance from nearest edge in crop-field (a) vs. rangeland (b) landscapes in eastern Colorado.

teen-lined ground squirrel (*Spermophilus tridecemlineatus*) (Knopf, 1996). Although predators often concentrate their foraging activities and movements along habitat edges in other biomes (Yahner and Wright, 1985), these predators of shortgrass prairie apparently do not hunt along anthropogenic edges selectively.

We conclude that anthropogenic edges have minimal or no effect on the nest success of mountain plovers in shortgrass prairie landscapes. The shortgrass prairie, like many other grassland ecosystems, has become highly fragmented over the past century. The preservation of these grassland ecosystems is not only important to the breeding ecology of the mountain plover, but to all grassland bird species that have experienced dramatic population declines. Unlike some grassland avian species, the plover readily nests in crop fields, and our finding that nest success of the plover was independent of distance to an anthropogenic edge might make the mountain plover a unique avian species of this landscape. The significance of other factors, such as landscape heterogeneity and patch size, on mountain plover nest success remain to be examined.

We thank all the private landowners in eastern Colorado who allowed us to conduct research on their properties. We also thank our field technicians S. Musgrave, L. Figuero, M. Robbins, and L. Smythe for their hard work and dedication in assisting us with the collection of this data. Financial and logistical support was provided by the Colorado Farm Bureau, Colorado Division of Wildlife, United States Fish and Wildlife Service, and United States Geological Survey.

Literature Cited

AKAIKE, H. 1973. Information theory and an extension of the maximum likelihood principle. In: B. N. Petrov and F. Csáki, editors. Proceedings of the Second International Symposium on Information Theory, Akadémiai Kiadó, Budapest, Hungary. Pages 267–281.

ANDERSON, D. R., AND K. P. BURNHAM. 1999. General strategies for the analysis of ringing data. Bird Study 46(Supplement):261–270.

ASKINS, R. A. 1995. Hostile landscapes and the decline of migratory songbirds. Science 267:1956–1957.

BURGER, L. D., L. E. BURGER, AND J. FAABORG. 1994. Effects of prairie fragmentation on predation on artificial nests. Journal of Wildlife Management 58:249–254.

BURNHAM, K. P., AND D. R. ANDERSON. 2002. Model selection and inference, second edition. Springer-Verlag, New York.

GRAUL, W. D., AND L. E. WEBSTER. 1976. Breeding status of the mountain plover. Condor 78:265–267.

HOWARD, M. N., S. K. SKAGEN, AND P. L. KENNEDY. 2001. Does habitat fragmentation influence nest predation in the short-grass prairie? Condor 103: 530–536.

HURVICH, C. M., AND C. TSAI. 1989. Regression and time series model selection in small samples. Biometrika 76:297–307.

KEYSER, A. J. 2002. Nest predation in fragmented forests: landscape matrix by distance from edge interactions. Wilson Bulletin 114:186–191.

KEYSER, A. J., G. E. HILL, AND E. C. SOEHREN. 1998. Effects of forest fragment size, nest density, and proximity to edge on the risk of predation to ground-nesting passerine birds. Conservation Biology 12:986–994.

KNOPF, F. L. 1994. Avian assemblages on altered grasslands. Studies in Avian Biology 15:247–257.

KNOPF, F. L. 1996. Mountain plover (*Charadrius montanus*). In: A. Poole and F. Gill, editors. The birds of North America, number 211. Academy of Natural Sciences, Philadelphia, Pennsylvania, and the American Ornithologists' Union, Washington, D.C.

KNOPF, F. L., AND B. J. MILLER. 1994. *Charadrius montanus*—montane, grassland, or bare-ground plover? Auk 111:504–506.

KNOPF, F. L., AND J. R. RUPERT. 1999. The use of crop fields by breeding mountain plovers in Colorado. Studies in Avian Biology 19:81–86.

LEBRETON, J.-D., K. P. BURNHAM, J. CLOBERT, AND D. R. ANDERSON. 1992. Modeling survival and testing biological hypotheses using marked animals: a unified approach with case studies. Ecological Monographs 62:67–118.

MABEE, T. J. 1997. Using egg shell evidence to determine nest fate of shorebirds. Wilson Bulletin 109: 307–313.

MURPHY, M. T. 2003. Avian population trends within the evolving agricultural landscape of eastern and central United States. Auk 120:20–34.

PATON, P. W. 1994. The effect of edge on avian nest success: how strong is the evidence? Conservation Biology 8:17–26.

PETERJOHN, B. G., AND J. R. SAUER. 1999. Population status of North American grassland birds from the North American Breeding Bird Survey, 1966–1996. Studies in Avian Biology 19:27–44.

RAPPOLE, J. H., AND M. V. MCDONALD. 1994. Cause and effect in population declines of migratory birds. Auk 111:652–660.

RIVERS, J. W., D. P. ALTHOFF, P. S. GIPSON, AND J. S. PONTIUS. 2003. Evaluation of a reproductive in-