

Geographic Affinity of Bird Species Associated with Rocky Mountain Juniper Woodlands and Adjacent Grasslands in Southwestern South Dakota

CAROLYN HULL SIEG

Rocky Mountain Forest and Range Experiment Station
South Dakota School of Mines Campus, Rapid City, SD 57701

ABSTRACT — Bird populations were sampled monthly for two years in Rocky Mountain juniper (*Juniperus scopulorum*) stands and adjacent grasslands in Badlands National Park. In spite of the generally western distribution of Rocky Mountain juniper, the majority of the 62 species of birds observed are pandemic to the Great Plains. The preponderance of pandemic species was attributed to the small area of the juniper stands, limited deciduous cover, and relative isolation from other large forests. The domination by tree canopy nesters and limited number of cavity nesters was attributed to the low shrub cover and near absence of snags in the juniper stands.

On the generally treeless grasslands of the northern Great Plains, small, interspersed woodlands such as riparian stands and woody draws provide critical bird habitat (Faanes 1983, 1984; Hopkins et al. 1986; Hodorff et al. 1988). However, little published information exists on bird species associated with Rocky Mountain juniper stands found scattered along the river breaks of major rivers in western South Dakota. The purpose of this paper is to provide baseline data on year-round avian use of Rocky Mountain juniper (*Juniperus scopulorum*) stands and adjacent grasslands in Badlands National Park. Given the generally westerly distribution of Rocky Mountain juniper (Fowells 1965), I hypothesized that these stands would tend to attract many avian species with a western geographic affinity. Further, I hypothesized that the limited shrub cover and absence of large decadent trees in the juniper study sites (Sieg 1988) would tend to favor canopy nesting species over shrub nesters or cavity nesters.

STUDY AREA AND METHODS

The study area is in Pennington County, approximately 15 km south of the town of Wall, in Sage Creek Basin. Eight 60- x 400-m study sites were established: four in Rocky Mountain juniper woodlands in draws, and four on adjacent grasslands. The juniper stands were essentially monocultures of Rocky Mountain juniper, with sparse understories dominated by yellow sweetclover (*Melilotus officinalis*), stoneyhills muhly (*Muhlenbergia cuspidata*), and littleseed ricegrass (*Oryzopsis micrantha*)

(Sieg 1988). Western wheatgrass (*Agropyron smithii*) and needle-and-thread grass (*Stipa comata*) were the most common plants on the grasslands, followed by blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*). Shrub cover averaged less than 5%.

Bird populations were sampled year-round for two consecutive years (1981-1983) along 400-m transects. The surveyor slowly walked the transect and recorded the number and species of birds seen and/or heard within 30 m of the transect. If an individual crossed into the transect more than once, only the first observation was recorded. The surveys were conducted monthly beginning in June. Surveys were started within 30 minutes of sunrise and were conducted for four consecutive days unless unfavorable weather (eg. winds > 15 kph or heavy rain) precluded sampling. It is unlikely that many birds were not detected, because of the narrow widths of the juniper stands (Emlen 1971, Conner and Dickson 1980, Yahner 1983) and the high degree of visibility on grassland sites. Nests were located by conducting systematic searches each spring. If males were observed singing on two or more occasions during the breeding season, the species was considered a probable breeding species.

Species were categorized into general geographic affinities, similar to Johnsgard's (1979) classification: (1) **pandemic**: distribution pattern not clearly associated with specific major vegetation types; (2) **endemic**: largely limited to grasslands or marshes of the Great Plains; (3) **eastern**: generally associated with deciduous forest areas to the east or southeast; (4) **northern**: generally associated with boreal forests to the north or northeast; (5) **southern**: generally associated with deserts or scrublands to the south or southwest; (6) **western**: generally associated with montane forests to the west or northwest. Breeding species were categorized according to substrates where they commonly nest (Ehrlich et al. 1988).

RESULTS

Juniper

A total of 62 species of birds were observed in juniper stands: 47% were pandemic, 18% northern, 16% western, 13% eastern, 5% endemic, and 1% southern. Pandemic species predominated in all seasons, constituting between 51 and 58% of the total observations (Fig. 1). The highest percentage of northern species in juniper stands occurred in the winter (35%), followed by the fall (20%) and spring (15%); northern species were not present in juniper stands in the summer. Western species comprised 15% of the observations in the winter, approximately 20% in the spring and fall and 30% in the summer months. Eastern species were absent from juniper stands in the winter; they constituted approximately 6% of the spring and fall observations and 12% of the summer observations.

American robins (see scientific names in Table 1) and black-capped chickadees were common pandemic species observed in juniper stands

Juniper

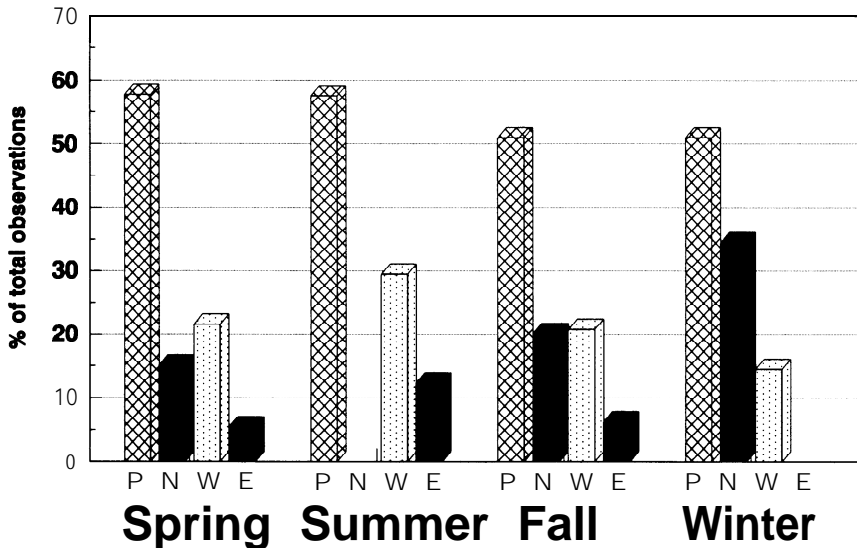


Figure 1. Percentage of total bird observations, by season and geographic affinity, in Rocky Mountain juniper woodlands in western South Dakota. (P = pandemic, N = northern; W = western; E = eastern).

throughout the year; mourning doves, rufous-sided towhees, and chipping sparrows were present in all seasons except winter (Table 1). Dark-eyed juncos, American tree sparrows, and Bohemian waxwings were the most abundant northern species observed in juniper stands; increasing numbers of these three species accounted for the large percentage of northern species in the winter. Townsend's solitaires, lark sparrows, western meadowlarks, and black-billed magpies were the most common western species observed in juniper stands. Lark sparrows and meadowlarks predominated during the growing season; Townsend's solitaires were present in every season except summer, and black-billed magpies were present year around. Field sparrows constituted the largest percentage of eastern species observed in juniper stands; brown thrashers and eastern kingbirds were other less common species with an eastern geographic affinity. The only endemic species observed in juniper stands were upland sandpipers, clay-colored sparrows, and chestnut-collared longspurs; blue grosbeaks were the only southern species observed in juniper stands.

At least eight species nested in juniper stands, and three others were probable breeding species, of which the majority (mourning doves, long-eared owls [see also Paulson and Sieg 1984], American crows, American

Table 1. Number of individual birds, by species and season, observed on Rocky Mountain juniper (*Juniperus scopulorum*) and grassland study sites in southwestern South Dakota.

Common name	Scientific name	No. individuals							
		Juniper				Grassland			
		SP ¹	SU	FA	WI	SP	SU	FA	WI
Pandemic species:									
Canada goose	<i>Branta canadensis</i>	—	—	—	—	2	—	—	—
Mallard	<i>Anas platyrhynchos</i>	5	—	—	—	—	1	—	—
Turkey vulture	<i>Cathartes aura</i>	—	3	2	—	—	4	—	—
Sharp-shinned hawk	<i>Accipiter striatus</i>	1	—	—	—	—	—	—	—
Red-tailed hawk	<i>Buteo jamaicensis</i>	—	—	2	—	—	1	—	—
Northern harrier	<i>Circus cyaneus</i>	6	2	4	5	12	6	3	4
Killdeer	<i>Charadrius vociferus</i>	—	—	—	—	—	1	—	—
Mourning dove ^{2,3}	<i>Zenaida macroura</i>	58	198	48	—	30	70	20	—
Great-horned owl	<i>Bubo virginianus</i>	—	—	—	3	—	—	—	—
Long-eared owl ^{2,3}	<i>Asio otus</i>	32	16	17	9	1	—	—	—
Short-eared owl ²	<i>Asio flammeus</i>	1	2	1	—	2	—	—	—
Common nighthawk	<i>Chordeiles minor</i>	—	4	—	—	—	1	—	—
Northern flicker	<i>Colaptes auratus</i>	5	1	11	—	1	1	1	—
Downy woodpecker	<i>Picoides pubescens</i>	2	4	2	1	—	—	—	—
Horned lark	<i>Eremophila alpestris</i>	—	2	2	10	37	21	99	47
Barn swallow	<i>Hirundo rustica</i>	—	6	1	—	—	18	2	—
Cliff swallow	<i>Hirundo pyrrhonota</i>	—	13	—	—	—	123	—	—
American crow ²	<i>Corvus brachyrhynchos</i>	51	35	1	2	19	13	2	2
Black-capped chickadee	<i>Parus atricapillus</i>	42	82	85	79	—	—	—	—
American robin ⁴	<i>Turdus migratorius</i>	118	37	148	293	13	—	39	—
Cedar Waxwing	<i>Bombycilla cedrorum</i>	—	—	1	—	—	—	—	—
Loggerhead shrike	<i>Lanius ludovicianus</i>	2	14	—	—	1	—	—	—
Yellow-breasted chat	<i>Icteria virens</i>	—	6	—	—	—	—	—	—
Red-winged blackbird	<i>Agelaius phoeniceus</i>	16	1	—	—	—	9	—	—
Northern oriole	<i>Icterus galbula</i>	—	3	—	—	—	—	—	—
Brown-headed cowbird ⁴	<i>Molothrus ater</i>	29	35	—	—	2	1	—	—
American goldfinch	<i>Carduelis tristis</i>	—	11	19	—	—	3	2	—
Rufous-sided towhee ³	<i>Pipilo erythrophthalmus</i>	25	119	17	—	—	—	—	—
Grasshopper sparrow	<i>Ammodramus savannarum</i>	—	2	—	—	12	82	11	—
Vesper sparrow	<i>Poocetes gramineus</i>	—	—	—	—	2	—	2	—
Chipping sparrow ³	<i>Spizella passerina</i>	41	101	65	—	20	4	—	—
Song sparrow	<i>Melospiza melodia</i>	—	—	1	—	—	—	—	—
Northern species:									
Rough-legged hawk	<i>Buteo lagopus</i>	—	—	—	—	—	—	1	—
Golden eagle	<i>Aquila chrysaetos</i>	—	—	—	1	—	—	—	1
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	—	—	2	6	22	18	4	43
Brown creeper	<i>Cerbia americana</i>	1	—	—	2	—	—	—	—
Swainson's thrush	<i>Catbarus ustulatus</i>	—	—	19	—	—	—	—	—
Golden-crowned kinglet	<i>Regulus satrapa</i>	5	—	—	4	—	—	—	—
Ruby-crowned kinglet	<i>Regulus calendula</i>	—	—	1	—	—	—	—	—
Bohemian waxwing	<i>Bombycilla garrulus</i>	63	—	—	61	—	—	—	—
Yellow-rumped warbler	<i>Dendroica coronata</i>	1	—	12	—	—	—	—	—
Pine siskin	<i>Carduelis pinus</i>	—	—	28	—	—	—	—	—
Dark-eyed junco	<i>Junco hyemalis</i>	39	—	97	129	—	—	—	—
American tree sparrow	<i>Spizella arborea</i>	5	—	10	69	13	—	—	4
Lapland longspur	<i>Calcarius lapponicus</i>	—	—	—	—	—	—	—	2

Table 1. (continued)

Common name	Scientific name	SP ¹	No. individuals						
			Juniper			Grassland			
			SU	FA	WI	SP	SU	FA	WI
Western species:									
Swainson's hawk	<i>Buteo swainsoni</i>	12	—	—	—	1	4	—	—
Prairie falcon	<i>Falco mexicanus</i>	—	—	—	—	—	—	2	—
Western kingbird	<i>Tyrannus verticalis</i>	—	—	—	—	1	11	—	—
Black-billed magpie ²	<i>Pica pica</i>	19	18	35	46	1	1	5	4
Red-breasted nuthatch	<i>Sitta canadensis</i>	1	—	6	—	—	—	—	—
Townsend's solitaire	<i>Myadestes townsendi</i>	49	—	104	69	—	—	1	—
Orange-crowned warbler	<i>Vermivora celata</i>	5	—	6	—	—	—	—	—
Western meadowlark ³	<i>Sturnella neglecta</i>	57	88	18	—	238	167	98	—
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	2	10	—	—	—	—	—	—
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	—	1	2	—	—	—	—	—
Lark sparrow ⁴	<i>Chondestes grammacus</i>	17	237	3	—	4	16	—	—
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	11	—	—	—	—	—	—	—
Eastern species:									
American kestrel	<i>Falco sparverius</i>	—	1	1	—	2	8	—	—
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	—	—	—	—	—	—	1	—
Eastern kingbird	<i>Tyrannus tyrannus</i>	—	11	—	—	—	14	2	—
Blue jay	<i>Cyanocitta cristata</i>	1	—	2	—	—	—	—	—
Brown thrasher	<i>Toxostoma rufum</i>	4	22	12	—	—	—	—	—
Black-and-white warbler	<i>Mniotilta varia</i>	—	1	—	—	—	—	—	—
Ovenbird	<i>Seiurus aurocapillus</i>	1	—	—	—	—	—	—	—
Common grackle	<i>Quiscalus quiscula</i>	4	—	—	—	5	1	—	—
Field sparrow ³	<i>Spizella pusilla</i>	31	114	38	—	2	—	—	—
Endemic species:									
Upland sandpiper	<i>Bartramia longicauda</i>	1	1	—	—	7	3	—	—
Lark bunting	<i>Calamospiza melanocorys</i>	—	—	—	—	—	6	—	—
Clay-colored sparrow	<i>Spizella pallida</i>	—	—	8	—	—	1	—	—
Chestnut-collared longspur	<i>Calcarius ornatus</i>	—	—	5	—	—	1	14	—
Introduced species:									
Ring-necked pheasant	<i>Phasianus colchicus</i>	—	—	—	—	—	—	2	—
European starling	<i>Sturnus vulgaris</i>	—	—	—	—	1	—	9	—
Southern species:									
Blue grosbeak	<i>Guiraca caerulea</i>	—	2	—	—	—	—	—	—

¹Season: SP = spring (March-May); SU = summer (June-August); FA = fall (September-November); WI = winter (December-February).

²Nest observed.

³Fledglings observed.

⁴Probable breeding species, as indicated by song on two or more occasions during the breeding season.

robins, rufous-sided towhees, chipping sparrows, and brown-headed cowbirds) were pandemic species (Table 1). Two species, the black-billed magpie and lark sparrow, showed a western geographic affinity; the field sparrow was the only breeding species in juniper stands with an eastern geographic affinity. Further, the majority of the breeding birds in juniper stands nested in the tree canopy; the black-capped chickadee was the only cavity nester observed in juniper stands.

Grasslands

Forty-six species of birds were observed on grassland study sites. Of these, 50% were pandemic, 11% northern, 15% western, 11% eastern, 9% endemic, and 4% introduced. Pandemic species predominated in all seasons except spring and constituted between 34 and 59% of the total observations on grasslands (Fig. 2). Northern species constituted less than 8% of the observations on grasslands in the spring, summer, and fall, but made up 47% of the winter observations. The proportion of the total grassland observations that were western species ranged from a low of 4% in the winter to a high of 54% in the spring. The percentage of eastern birds on grasslands varied from 0% in the winter to only 4% in the summer.

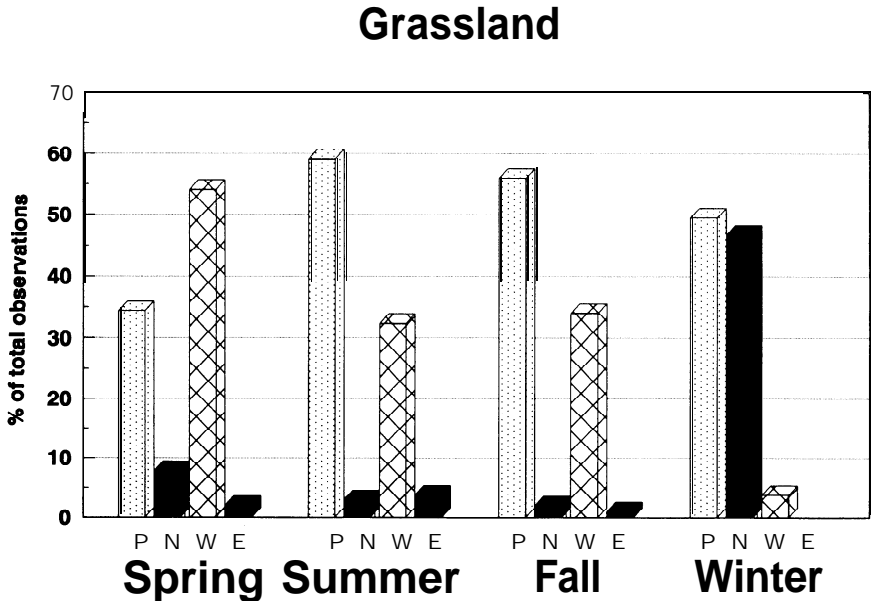


Figure 2. Percentage of total bird observations, by season and geographic affinity, on grassland study sites in western South Dakota. (P = pandemic; N = northern; W = western; E = eastern).

Horned larks, mourning doves, grasshopper sparrows, and American crows were the predominant grassland pandemic species; the horned lark was among the few species present in the winter (Table 1). Sharp-tailed grouse constituted the largest portion of the northern species, although American tree sparrows were present in low numbers in the winter and spring months. Black-billed magpies were the only western species to be observed on grasslands in the winter. Western meadowlarks were the predominant western species on grasslands between March and November, and their high numbers in the spring accounted for the high percentage of western species during that season. Only five species with an eastern geographic affinity were observed on grasslands: eastern kingbird, American kestrel, common grackle, field sparrow, and red-headed woodpecker. Species endemic to the Great Plains that were observed on grasslands included chestnut-collared longspurs, upland sandpipers, lark buntings, and clay-colored sparrows. The ring-necked pheasant and European starling were introduced species observed on grasslands; no southern species were observed. Four species nested on grasslands: three pandemic species (short-eared owls, mourning doves, and grasshopper sparrows) and one western species, the western meadowlark.

DISCUSSION

In the entire Great Plains area, the geographic affinities are 27% eastern, 23% pandemic, 20% western, 16% northern, 7% southern, and 5% endemic (Johnsgard 1979). In this study, pandemic species made up a higher proportion of the total number of species, and western and eastern made up lower proportions of the total number of species, compared to the Great Plains as a whole. The smaller percentage of western birds in juniper stands compared to the Great Plains overall may be attributed to the small area of the juniper woodlands and long distance from large tracts of juniper. Several other authors (e.g., Whitcomb 1977, Robbins 1979, Blake and Karr 1984) have reported bird species disappearances associated with forest fragmentation and isolation. Although the percentage of western species on grasslands was also lower than on the Great Plains overall, the percentage of the total numbers of birds contributed by western species was higher on grasslands than in juniper stands. Western grassland birds were not as limited in geographic range, compared to western juniper species, due to the continuity of grasslands extending westward into Wyoming.

Limited deciduous cover in the juniper stands and the long distance from large tracts of deciduous woodlands likely resulted in lower numbers of eastern species, compared to the Great Plains as a whole. Several other species with eastern geographic affinities, including eastern bluebirds (*Sialia sialis*), red-eyed vireos (*Vireo olivaceus*), American redstarts (*Setophaga ruticilla*), and Indigo buntings (*Passerina cyanea*) were observed in green ash (*Fraxinus pennsylvanica*)/ chokecherry (*Prunus virginiana*) woodlands in northwestern South Dakota

and Sieg 1986). However, the larger number of eastern species in juniper stands compared to grasslands indicates that juniper stands apparently provide some of the structural attributes attractive to eastern avian species.

The slightly higher percentage of northern species in this study, compared to the Great Plains overall, is probably due to the slightly northern location of the study site in the Great Plains area. Northern species became more prevalent in the winter in both juniper stands and on grasslands, as these species migrated southward. Based on the large number of birds observed in juniper stands in the winter, these woodlands are likely important sources of food (especially juniper berries) and shelter in the winter (Sieg 1991), but well-vegetated grasslands near the juniper stands provide winter habitat for northern species such as sharp-tailed grouse.

The high proportion of pandemic breeding species associated with juniper communities is consistent with breeding bird surveys in Rocky mountain juniper woodlands in western North Dakota (Hopkins et al. 1986), and can likely be attributed to the same factors that limit eastern and western species during the remainder of the year: the isolation of these stands. The domination of breeding bird species in juniper stands by tree canopy nesters and the limited number of cavity nesters was attributed to the low shrub cover and near absence of snags in juniper stands (Sieg 1988). Hopkins et al. (1986) reported similar results, with the majority of the breeding species nesting in the tree canopy, on the ground, or in the shrub-sapling layer; cavity nesters were absent from juniper stands.

Although I speculated that juniper stands would support a large percentage of western bird species due to the generally westerly distribution of Rocky Mountain juniper, these stands are apparently too isolated from large forested tracts, both deciduous forests to the east and coniferous communities to the west, and too poorly connected with adequate corridors for dispersal of many bird species. Only well-distributed bird species, not strongly associated with specific vegetation types, are well-suited to take advantage of the year-round habitat provided by juniper stands.

ACKNOWLEDGMENTS

I am grateful to Deb Paulson and Bob Hodorff, who spent many hours in the field, and to the personnel at Badlands National Park for their assistance and cooperation. Deb Paulson, Bob Hodorff, Nathaniel Whitney, and Les Baylor provided critical comments on an earlier draft of this manuscript.

LITERATURE CITED

Blake, J. G., and J. R. Karr. 1984. Species composition of bird

- communities and the conservation of large versus small forests. *Biol. Conserv.* 30:173-187.
- Conner, E. F., and J. G. Dickson. 1980. Strip transect sampling and analysis for avian habitat studies. *Wildl. Soc. Bull.* 8:4-10.
- Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. *The birder's handbook*. Simon and Schuster Inc., New York.
- Emlen, J. T. 1971. Population densities of birds derived from transect counts. *Auk* 88:323-342.
- Faanes, C. A. 1983. Breeding birds of wooded draws in western North Dakota. *Prairie Nat.* 15:173-187.
- Faanes, C. A. 1984. Wooded islands in a sea of prairie. *Am. Birds* 38:3-6.
- Fowells, H. A. 1965. Rocky Mountain juniper (*Juniperus scopulorum* Sarg.). Pp. 217-222 in *Silvics of forest trees of the United States*. U.S. Dep. Agric. Agric. Handb. No. 271.
- Hodorff, R. A., and C. H. Sieg. 1986. Bird species associated with green ash woodlands in the Slim Buttes, South Dakota. *S.D. Bird Notes* 38: 56-60.
- Hodorff, R. A., C. H. Sieg, and R. A. Linder. 1988. Wildlife response to stand structure of deciduous woodlands. *J. Wildl. Manage.* 52:667-673.
- Hopkins, R. B., J. F. Cassel, and A. J. Bjugstad. 1986. Relationships between breeding birds and vegetation in four woodland types of the Little Missouri National Grassland. U.S. For. Serv. Rocky Mt. For. Range Exp. Stn. Res. Pap. RM-270.
- Johnsgard, P. A. 1979. *Birds of the Great Plains*. University of Nebraska Press, Lincoln.
- Paulson, D. D., and C. H. Sieg. 1984. Long-eared owls nesting in Badlands National Park. *S.D. Bird Notes* 36:72-75.
- Robbins, C. S. 1979. Effects of forest fragmentation on bird population. Pp. 198-212 in *Management of north central and northeastern forests for nongame birds* (R. M. DeGraaf and K. E. Evans, compilers). U.S. For. Serv. N. Cent. For. Exp. Stn. Gen. Tech. Rep. NC-51.
- Sieg, C. H. 1988. The value of Rocky Mountain juniper (*Juniperus scopulorum*) woodlands in South Dakota as small mammal habitat. Pp. 328-332 in *Management of amphibians, reptiles, and small mammals in North America* (R. C. Szaro and K. E. Severson, eds). U.S. For. Serv. Rocky Mt. For. Range Exp. Stn. Gen. Tech. Rep. RM-166.
- Sieg, C. H. 1991. Rocky Mountain juniper woodlands: Year-round bird habitat on the northern Great Plains. U.S. For. Serv. Rocky Mt. For. Range Exp. Stn. Res. Pap. RM - 296.
- Whitcomb, R. F. 1977. Island biogeography and "habitat islands" of eastern forest. I. Introduction. *Am. Birds* 31:3-5.
- Yahner, R. H. 1983. Seasonal dynamics, habitat relationships, and management of avifauna in farmstead shelterbelts. *J. Wildl. Manage.* 47:85-104.

Received 26 November 1990 Accepted 11 March 1991