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Endemicity and Regional Biodiversity in Nebraska's Breeding Avifauna[1]

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I estimate that 215 bird species currently breed or have previously bred in Nebraska. This number compares with a total of 330 species that breed or have bred in the Great Plains region south of Canada, as I defined that region in my book on the breeding birds of the Great Plains (Johnsgard, 1979).

Grasslands or potential grasslands make up about 81 percent of the Great Plains' vegetation, and probably represented about 96 percent of Nebraska's original vegetation. Only in the Sandhills region is that vegetation type still essentially intact; the tall-grass prairie of eastern Nebraska is virtually gone. In my 1979 summary, I judged that 36 species of Great Plain's bird are grassland-adapted forms, with 15 of these endemic to the Great Plains, and the rest more broadly distributed. Nine of these endemics breed in Nebraska (Greater Prairie-Chicken, Mountain Plover, Long-

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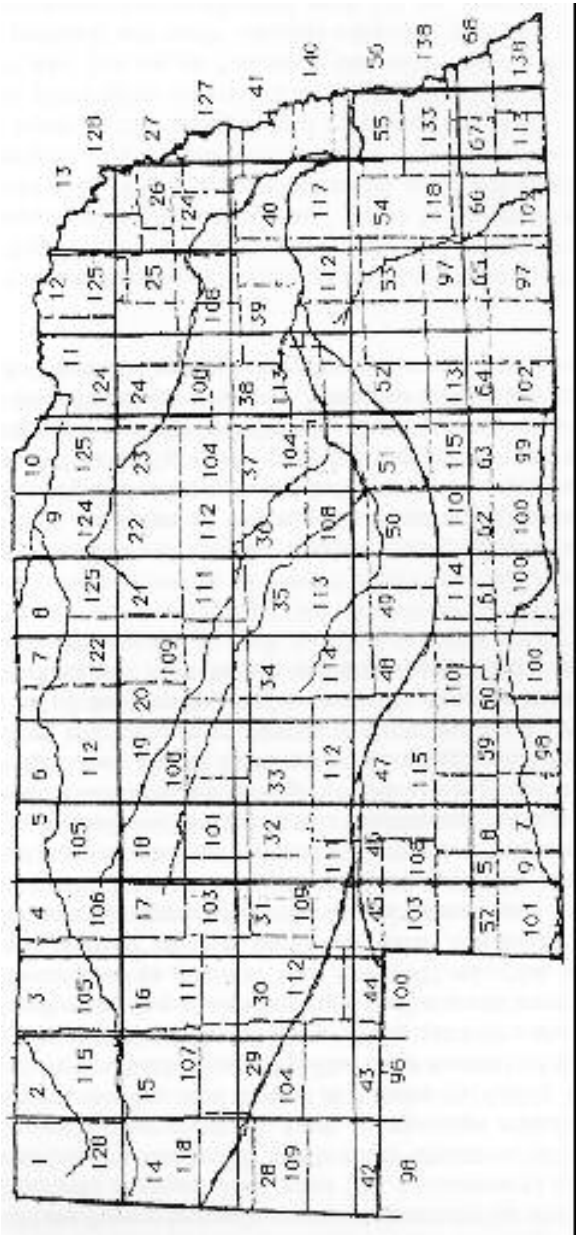
billed Curlew, Upland Sandpiper, Dickcissel, Lark Bunting, Clay-colored Sparrow, Cassin's Sparrow, McCown's Longspur and Chestnut-collared Longspur), and the Chihuahuan Raven also once did. None of these ten species is considered endangered nationally, although the Greater Prairie-chicken needs to be monitored closely. Birds of the tall-grass prairie that currently breed in eastern Nebraska include the Upland Sandpiper, Dickcissel. Eastern Meadowlark, Field Sparrow and Henslow's Sparrow. Both of the latter are not, strictly speaking, prairie species, but either represent a later successional stage containing some small trees (Field Sparrow), or the presence some brushy or weedy elements (Henslow's Sparrow). In the west the short-grass plains support several declining or rare species, including Ferruginous Hawk, Swainson's Hawk, Prairie Falcon, Mountain Plover, Burrowing Owl, Common Poor-will, Lark Bunting, and two longspurs. Some of these also have certain additional non-vegetative needs such as cliff-side nest sites (Prairie Falcon), burrows (Burrowing Owl), nearly bare ground (Mountain Plover), or rocky substrates (Poor-will). The geographically and ecologically intermediate Sandhills prairies support many typical grassland and wet meadow breeders, such as Sharp-tailed Grouse, Long-billed Curlew, Bobolink, Lark Sparrow, Grasshopper Sparrow and Horned Lark.

Woodlands and forests comprise about 15 percent of the native vegetation of the Great Plains states, and support some 51 percent of the region's breeding avifauna (Johnsgard, 1979). I estimate that in Nebraska this vegetation type occupies three percent of the state's surface area, and supports 48 percent of its avifauna. It is thus one of the most important vegetation types for generating species diversity of our avifauna. Bald Eagles are among the rare woodland-nesting species of Nebraska, although they are also strongly water-dependent for food. Several hawks

(Broad-winged, Red-shouldered, Cooper's, etc.) are other clear associates of mature woodlands. Several woodland nesting passerines that have generally large ranges elsewhere in the central or western states are limited to woodlands in extreme northwestern Nebraska's Pine Ridge region, or in the lower Missouri woodlands of extreme southeastern Nebraska (see Table 2).

Wetlands (including rivers, lakes, large reservoirs, etc.) cover only about one percent of the surface area of the Great Plains states, but support 21 percent of its breeding avifauna, thus contributing more to the region's avifauna diversity than any other habitat type relative to is area (Johnsgard, 1979). Similarly, surface water covers only about one percent of Nebraska's surface, but such areas support 27 percent of our breeding avifauna. Rare or localized species that depend on such wetlands in Nebraska include the Trumpeter Swan, Black-necked Stilt, White-faced Ibis, Least Tern and Piping Plover. All of the rails are marsh dependent and thus rather localized; but the breeding status of the Black Rail in Nebraska is still unknown. The Northern Harrier also nests in marshes, but forages over meadows and grasslands. The Sandhill Crane once bred in Nebraska's Sandhill marshes, and may again return as a breeding species, just as the Bald Eagle has done. Wetlands also provide extremely important migratory habitats in Nebraska for many species of shorebirds, waterfowl, and cranes, including the endangered Whooping Crane.



Estimated Number of Breeding Species in 68 Nebraska Quadrants

Methods

As part of the ongoing national interest in defining Important Bird Areas, I decided that an analysis of my distribution maps of the breeding ranges of Nebraska's avifauna would be of value. These maps, originally drawn for my book on the breeding birds of the Great Plains (Johnsgard, 1979) have been periodically updated; the most recent versions appear in my summary of Nebraska's avifauna (Johnsgard, 1998). Although I used my breeding-distribution maps for the Great Plains as my data source, I accepted the fact that the range limits indicated there are usually little more than "informed guesses," as we still lack highly detailed breeding range maps for most Nebraska species. When the Breeding Bird Atlas for Nebraska is finally published, we will have better mapping possibilities. My maps tend to be "generous" as to probable breeding occurrence; thus the Northern Harrier and Long-eared Owl were both mapped as occurring throughout the entire state, even though they respectively nest only in areas having available marshy or mature woodland breeding habitats. I prepared a transparent overlay map of the state, using the 68 quadrants of latitude and longitude that were adopted in the Nebraska Atlas and Gazetteer, one of a series of state atlases published by DeLorme Co., of Freeport, Maine.

Using these standardized quadrants makes for easy reference by others, and might facilitate future between-state comparisons as well. This atlas series' quadrants in Nebraska measure 30.7 miles (49.4 kilometers) in east-west distance and 44 miles (70.8 kilometers) in north-south distance, or 1,351 square miles (3,497 sq. kilometers) per quadrant. Each of my range maps was then compared with the quadrant overlay, and those alt quadrants falling within the species' indicated range were tallied (Figure 1). The

total number of species falling within each quadrant was then determined. Many of the quadrants along the southwestern and eastern borders of the state*are ones whose areas extend well beyond the state's legal boundaries (e.g., Nos. 10-13, 27, 41-45, 56, 68). A few species were tallied as "present" if they occurred within the limits of such quadrants although these species' apparent actual range limits failed to reach Nebraska's boundaries. Treated otherwise, projected species totals for these variably smaller border quadrants could not be numerically compared with numbers for those quadrants falling entirety within the state's boundaries. A total of 51 species were judged to be pandemic breeders throughout the state (Table 1), all the remaining 164 species were judged absent from one or more quadrants. At the other extreme are those species occurring in as few as a single quadrant; these are of special interest in terms of defining regional endemicity. Such species, which are clearly localized in Nebraska but may not be rare elsewhere in their ranges, are listed as regional endemics in Table 2.

Results

Ranges in estimated species diversity varied from as few as 96 species (quadrant 43) to a maximum of 140 species (quadrant 41). Part of this apparent variation reflects regional differences in data bases; thus quadrant 43 is located in the southwestern Panhandle, where few ornithologists have studied local birds, whereas quadrant 41 includes the Douglas County area, with its long history of ornithological investigations. However, several trends are clearly visible. The generally highest levels of species diversity occur along the lower Missouri River valley, from the Kansas border north to the Omaha area. Numbers gradually tail

off from that area up the Missouri and Niobrara valleys to about Cherry County, where there is apparently a sharp decline (quadrant 6), roughly where the mixed deciduous forest changes to a ponderosa pine forest. There is a second center of breeding biodiversity centered in Sioux County (quadrant 1), tapering off in Dawes and Scottsbluff counties (quadrants 2 & 14). The Platte Valley represents a corridor of moderate diversity, but the Republican River Valley along the lowest tier of quadrants is distinctly less diverse in its breeding avifauna than are other regions. The Sandhills region shows only slightly less diversity than the Platte Valley, probably because of the substantial number of wetland species breeding with the region.

There are some ways of comparing these hypothetical estimates of breeding diversity with actual estimates. Thus, quadrant 32 includes the Cedar Point Biological Station area, where 111 species were judged as likely breeders. The known total number of breeding species as of 1996 was 104 (Brown et a)., 1996). Quadrant 19, with 108 prospective breeding species includes Valentine National Wildlife Refuge, which has at least 93 known breeders. The Lancaster County list of breeding birds includes at least 103 species (personal determination), as compared with an estimated total of 118 species for all of quadrant 54. These numbers suggest that the margin of overestimates for these projected figures may average only about ten percent, and should be less if the entire quadrant area were carefully surveyed.

Discussion

Important Bird Areas have been defined as those that (1) support threatened or endangered species, (2) support rare or endemic species, or species of special conservation concern, (3) include

species associated with rare or threatened habitats, (4) represent sites supporting areas of high numerical population abundance or species diversity, or (5) those where long-term monitoring has occurred. The data presented here offers direct information on points two and four. Information on the distribution of rare and endangered species, as well as of endangered habitats, is available through state and federal agencies, the Nature Conservancy, and similar conservation groups Long-term monitoring of bird populations has gone only in only a few sites, most obviously some of the state's major national wildlife refuges and Cedar Point Biological Station, all of which are obvious candidates for inclusion.

Thus regions that should be examined for the identification of important bird areas on the basis of unusually high species diversity should include the lower Missouri Valley (e.g., Indian Cave State Park, Fontenelle Forest , etc.). It should also include much of the Pine Ridge's already preserved areas. The middle Niobrara River Valley is of special interest as an east-west fauna! transition zone (Johnsgard, 1982), and one of the major "suture zones" of overlapping eastern and western biota. The Platte Valley has similar basic biological significance, especially the region of the middle Platte, which additionally supports major populations of threatened Least Terns and Piping Plovers, and critical habitat for the endangered Whooping Crane. The Lake McConaughy area is already known to support one of the highest areas of avian species diversity in the entire country (Brown et al., 1996), and additionally includes Cedar Point Biological Station.

Summary

An analysis of the relative species diversity of Nebraska's breeding

avifauna establishes several areas of unusual species richness and endemicity, these most important being the Missouri Valley and associated middle to lower Niobrara Valley, the Pine Ridge area of the northwestern Panhandle, and the entire Platte Valley.

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Table 1

Species of Birds Considered as Pandemic Breeders Across Nebraska

Pied-billed Grebe
American Bittern
Great Blue Heron
Black-crowned Night Heron
Canada Goose
Mallard
Northern Pintail
Blue-winged Teal
Red-tailed Hawk
American Kestrel
Northern Harrier
American Coot
Killdeer
Rock Dove
Mourning Dove
Yellow-billed Cuckoo
Barn Owl
Great Horned Owl
Long-eared Owl
Common Nighthawk
Belted Kingfisher
Downy Woodpecker
Hairy Woodpecker
Western Kingbird
Eastern Kingbird
Northern Rough-winged Swallow
Bank Swallow
Cliff Swallow
Barn Swallow
Blue Jay
American Crow
House Wren
American Robin
Gray Catbird
Loggerhead Shrike
European Starling
Yellow Warbler
Common Yellow-throat
Blue Grosbeak
Chipping Sparrow
Lark Sparrow
Grasshopper Sparrow
Red-winged Blackbird
Western Meadowlark
Yellow-headed Blackbird
Common Grackle
Brown-headed Cowbird
American Goldfinch
House Sparrow

Table 2

Species of Birds Considered to be Endemic to Specific Nebraska Regions

Northwestern Panhandle Endemics	Lower Missouri Valley Endemics
White-throated Swift	Red-shouldered Hawk
Lewis' Woodpecker	Broad-winged Hawk
Cordilleran Flycatcher	Chuck-wills-widow
Plumbeus Vireo	White-eyed Vireo
Pinyon Jay	Carolina Wren
Violet-green Swallow	Summer Tanager
Brown Creeper	Northern Parula
Pygmy Nuthatch	Cerulean Warbler
Mountain Bluebird	Prothonotary Warbler
Townsend's Solitaire	Kentucky Warbler
Swainson's Thrush	Yellow-throated Warbler
Sage Thrasher	
Western Tanager	**Southwestern Panhandle Endemics**
Yellow-rumped Warbler	Mountain Plover
Brewer's Sparrow	Cassin's Kingbird
Dark-eyed Junco	Cassin's Sparrow
McCown's Longspur	
Chestnut-collared Longspur	