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Paul A. Johnsgard

University of Nebraska–Lincoln, pajohnsgard@gmail.com

John Dinan

Nebraska Game and Parks Commission

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HABITAT ASSOCIATIONS OF NEBRASKA BIRDS

Paul A. Johnsgard
School of Biological Sciences
University of Nebraska
Lincoln

John Dinan
Nebraska Game & Parks Commission
Lincoln

In the fall of 2003 we set out to assign habitat associations to 363 species of birds that regularly occur in Nebraska for the purpose of evaluating the relative importance of each of Nebraska's major habitats to the state's breeding, migrating and wintering birds. It is our hope that this information will 1) provide the first thorough investigation of Nebraska's birds and the habitats they use, and 2) provide a method for prioritizing the conservation of Nebraska's varied habitats for birds. The resulting spreadsheet matrix showing the assigned habitat values for all 363 species may be seen at the following URL:

http://www.nebraskabirds.org/Resources/resources_files/Matrix%20Guide.pdf

METHODS

We began by gathering habitat descriptions from all the major state bird atlases that we could find, especially those from states immediately surrounding Nebraska. Of these, the *Colorado Breeding Bird Atlas* (Kingery 1998) was especially valuable for its quantitative habitat analyses.

We also chose to use names and descriptions of the state's natural terrestrial habitats as identified by Steinauer and Rolfsmeier (2003), although these were generally chosen as a coarser level of analysis than the most specific types identified by them. Additionally, because these authors excluded some non-native communities (e.g., agricultural lands), deep water aquatic communities (e.g., rivers, lakes, reservoirs) and transitional communities (e.g., shorelines and woodland edge habitats), we added several new categories. We thus identified a total of 29 habitats of significance to Nebraska birds (Table 1).

We also summarized all of our data by habitat type, including an estimate of the percentage of the state's overall area (about 78,000 square miles) occupied by that habitat type (Table 2).

Habitat area estimates are Johnsgard's, and are based on various sources, including CALMITs (2002) statewide GAP analyses and Lawson *et al.* (1977). They should not be considered as authoritative, and those labeled as "est." (estimate) are generally less reliable than those labeled as "c" (*circa*). Thus, average Nebraska stream width is assumed at 20 feet, and collective state stream length at 10,000 miles. Some published estimates suggest greater total state stream length but

probably include very small streams. The collective areas of narrow and linear habitats (shorelines, woodland edges) are difficult to quantify owing to highly variable ecological widths, such as the widths of river floodplains and forest-grassland transition zones. Thus, our estimates are based on the best information available, but their accuracy is unknown.

Alkaline wetlands are permanent Sandhills wetlands at least 12 acres in size and with moderate or higher alkalinity (McCarrahar 1977), plus about five square miles of relict saline wetlands in southeastern Nebraska. Including slightly alkaline and smaller alkaline Sandhills wetlands would increase the total area estimate, as would adding temporary (playa) alkaline wetlands, which are separately listed. There are about 2,000 square miles of shallow lakes, marshes and wet meadows in the Sandhills alone, excluding the estimated 50 square miles of highly alkaline wetlands (LaGrange 1997). The overall area ratio of wet meadows to marshes in the Sandhills is roughly 6:1, as there are about 177,000 acres of open water and marshes. The indicated Nebraska prairie dog acreage is a 2003 estimate of active colonies, based on the mean of two independent surveys (Johnsgard 2005). The remaining habitat estimates seem fairly reliable, and were based on a variety of sources.

“S” rankings that follow area estimates identify the Nebraska Natural Heritage Programs rarity ranks (S1 = critically imperiled communities; S5 = secure communities), as provided by Steinauer and Rolfsmeier (2003). Using this ranking, playa wetlands and upland tallgrass prairies are the most endangered habitat types of major importance to birds in Nebraska. Habitats listed as “s?” were unranked by Steinauer and Rolfsmeier (2003).

Upper-case code letters identify each habitat's total number of species having major breeding (B), migration (M) and wintering (W) associations; b, m & w indicate corresponding minor associations, the distinction between major and minor based on the authors' subjective evaluations. For most resident species, wintering habitats are assumed to be the same as breeding habitats but are separately tallied. Breeding habitats are assigned only for species known to be currently or recently breeding within the state. (Sharpe *et al.* 2001)

Total is the collective number of species using the habitat in one or more seasons. Rank is based on total species associations relative to those of the other habitat types. Thus, 1 indicates the habitat type with the highest number of species associations and 29 is the lowest.

Use is an area-use index of estimated available habitat relative to its species-use, calculated as 100 times the total species associations, divided by the estimated square miles of the habitat believed by the authors to be present in Nebraska. Higher figures indicate richer species associations relative to amount of available habitat. This index is, by definition, area-dependent, and thus does not reflect overall habitat value of a community type, which is better estimated by the Total figures given above. Adding Total to Use ranks might provide a better overall index to the importance of each habitat to Nebraska birds (T + U Rank). By this index, alkaline wetlands (T+U = 6), playa wetlands (T+U =9), and woodland edges (T+U =9) are most valuable, and croplands (T+U =52) are least valuable. Within major categories, habitats are arranged by increasing T+U values, or estimated diminishing overall value to birds.

RESULTS

An assessment of the habitat preferences of 363 species of Nebraska birds indicates that, relative to the total state surface area represented by each habitat type, streams have the highest rate of multi-species bird usage. However, the greatest overall usage by the highest number of species of birds occurs in wet meadows and marshes. If both criteria are used cumulatively, alkaline wetlands rank highest, followed by playa wetlands, woodland edges, and streams.

These results have considerable value in assigning conservation priorities for obtaining and preserving relatively rare Nebraska habitats that have particular value to large numbers of bird species. The Nebraska Game and Parks Commission, The Nature Conservancy, the US Fish and Wildlife Service, and the Audubon Society are among the groups that might want to use these data in evaluating habitat priorities for possible preservation.

Limitations to the approach include the fact that a "pest" species such as the European Starling (*Sturnus vulgaris*) has the same weight in calculating avian habitat values as does, for example, the endangered Whooping Crane (*Grus americana*). However, habitat data for rare or endangered species can readily be extracted and evaluated separately, or such species may be given higher rank value than that assigned more common species. Another weakness lies in the difficulty of accurately estimating the areas of ephemeral habitats, such as playa wetlands. Again, when more accurate data on the areas of such elusive habitats become available, the matrix values can be easily recalculated.

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Table 1. Primary Nebraska habitat types of importance to birds.

FOREST (Wooded communities with canopies >5 m and > 60% canopy cover)

Lowland (Floodplain) Deciduous Forest

Upland Coniferous Forest

Upland Deciduous Forest

WOODLAND (Wooded communities with canopies <5 m
and 25–60% canopy cover)

Lowland (Floodplain) Deciduous Woodland

Upland Coniferous Woodland

Upland Deciduous Woodland

SHRUBLAND (Wooded communities with shrubs < 5 m
and > 25% canopy cover)

Lowland (Floodplain) Shrubland

Upland Shrubland

Sandsage Shrubland/Grassland

HERBACEOUS (Communities dominated by non-woody plants;
canopy cover >25%)

Lowland Tallgrass Prairie

Upland Tallgrass Prairie

Sand Hills Prairie

Mixed-grass Prairie

Shortgrass Prairie

SPARSE VEGETATION (Plant cover <25%, highly variable topography)

Badlands (Steep, eroded slopes)

Dry Cliffs/ Rock Cavities (Very steep rock escarpments)

Rock Outcrops (Moderate to fairly steep rock escarpments)

Sand or Gravel Flats (Barren riverine/lacustrine edges & bars)

WETLANDS

Alkaline (Saline) Wetlands

Playa (Seasonal) Wetlands

Wet Meadow/Marsh (Meadow: Marsh area ratio c. 6:1)

Open Water, Lakes & Reservoirs

Open Water, Streams & Rivers

Swamps/Wooded Backwaters (Woody oxbows, flooded trees)

Open Shorelines (Lightly vegetated shores)

OTHER HABITATS (Variable plant life-form and cover extent)

Cropland

Prairie Dog Colony

Urban/Parks/Bridges/Other human constructions

Woodland Edge (Woodlands edged by shrub & herbaceous communities)

Table 2. Seasonal habitat associations of birds in Nebraska

	Breeding B/b	Migration M/m	Winter W/w	Total (Rank)*	Use(Rank)**	T+U (Rank)***
FOREST (c. 2% of state area)						
Lowland Decid. Forest (c. 1,000 mi. ²) S3	31/11	20/8	20/1	91(6-tie)	9.1(18)	24(9-tie)
Upland Conif. Forest (c. 350 mi. ²) S2****	25/5	11/6	17/7	71(11)	20.3(16)	27(11-tie)
Upland Decid. Forest (c. 300 mi. ²) S3-S?	24/6	12/6	19/0	67(14)	22.3(15)	29(14-tie)
WOODLAND (est. 8%)						
Lowland Decid. Woodland (est. 2,000 mi. ²) s? 52/6	29/12	22/2	123(2-tie)	6.2(21-tie)	23(8)	
Upland Decid. Woodland (est. 2,000 mi. ²) s? 41/5	17/8	17/0	88(9)	4.4(25)	34(17)	
Upland Conif. Woodland (est. 2,000 mi. ²) s? 29/5	17/4	17/9	81(10)	4.1(26)	36(19)	
SHRUBLAND (est. 3%)						
Lowland Shrubland (est. 1,000 mi. ²) s? 23/1	20/5	7/0	56(16)	5.6(23)	39(21)	
Upland Shrubland (est. 1,000 mi. ²) s? 24/0	8/6	7/0	45(18)	4.5(24)	42(25-tie)	
Sand Sage Shrub (est. 300 mi. ²) S2? 13/3	2/1	5/1	25(26)	8.3(19)	45(27-tie)	
HERBACEOUS (c. 35%)						
Upland Tallgrass Prairie (est. <50 mi. ²) S1 27/3	3/0	6/2	41(19)	82(8)	27(11-tie)	
Lowland Tallgrass Prairie (est. <25 mi. ²) S2 19/2	5/0	7/1	34(22)	136(6)	28(13)	
Shortgrass Prairie (c. 775 mi. ²) S2? 38/2	6/1	8/2	57(15)	7.4(20)	35(18)	
Mixed-grass Prairie (c. 7,300 mi. ²) S3–4 38/2	8/1	13/6	68(13)	0.9(27)	40(22-tie)	
Sandhills Prairie (c. 19,000 mi. ²) S4-5 34/2	4/1	11/2	54(17)	0.3(28)	45(27-tie)	

	Breeding B/b	Migration M/m	Winter W/w	Total (Rank)*	Use(Rank)**	T+U (Rank)***
WETLANDS (c. 3%)						
Alkaline Wetlands***** (c. 50 mi. ²) S1-3	38/5	66/11	1/0	121(4)	242(2)	6(1)
Playa (Seasonal) Wetlands (c. 120 mi. ²) S1	33/5	75/9	1/0	123(2-tie)	102.5(7)	9(2-tie)
Streams (est. < 20 mi. ²) s?	7/1	36/19	6/0	69(12)	345(1)	13(4)
Lakes & Reservoirs (c. 310 mi. ²) s?	6/10	47/16	8/3	90(8)	29 (12)	20(6)
Wet Meadows/Marshes (est. 2,000 mi. ²) S2-4	43/7	64/9	1/0	124(1)	6.2(21-tie)	22(7)
Swamps, Wooded Backwaters (< 20 mi. ²) s?	10/3	11/1	4/0	29(24)	145(5)	29(14-tie)
Open Shorelines (est. <50 mi. ²) s?	6/0	23/4	2/0	35(21)	70(9)	30(16)
SPARSE VEGETATION (<1%)						
Sand or Gravel Flats (est. <20 mi. ²) S3-5	4/0	30/3	3/0	40(20)	200(4)	24(9-tie)
Cliffs & Rock Cavities (est. <10 mi. ²) S5	5/0	0/0	0/1	6(28)	60(10)	38(20)
Rock Outcrops (est. <10 mi. ²) S4	3/0	0/0	0/0	3(29)	30(11)	40(22-tie)
Badlands (est. <50 mi. ²) S3	4/1	2/0	4/1	12(27)	24(13)	40(22-tie)
OTHER HABITATS (c. 48%)						
Woodland Edges (est. < 40 mi. ²) s?	50/1	14/4	20/2	91(6-tie)	228(3)	9(2-tie)
Cities, Parks, Structures (c. 400 mi. ²) s?	42/1	14/7	27/3	94(5)	23.5(14)	19(5)
Prairie Dog Colonies (c. 160 mi. ²)***** s?	18/1	4/0	4/1	28(25)	17.5(17)	42(25-tie)
Croplands (c. 36,600 mi. ²) s?	6/1	16/1	7/2	33(23)	0.1(29)	52(29)

* Numbers in first three columns indicate number of major (M) /minor (m) species associations per habitat type per season, followed by total associations for all seasons. See text for rank calculation.

** "Use" is derived from formula: Total associations x 100/ Area of available habitat (mi.²). See text for rank calculation.

*** "T + U" equals totals of two prior rankings. Overall rank is derived these scores, sequenced from lowest to highest.

**** Estimate of Weaver, 1965

***** Estimate of Johnsgard, 2005 (average of two different 2003 surveys)

***** Estimate of LaGrange, 1997