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AVIAN POPULATIONS
AT THE ALE RESERVATION
1973

MASTER

A Report of Research Conducted
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MASTER

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Bunchgrass or palouse prairies in the northwestern United States are a unique form of the North American grasslands, largely because of their persistent, perennial physiognomy, their phenological patterns, and their often rigorous climate. Bird populations in these grasslands, and in associated shrubsteppe habitats, however, have received relatively little study (but see Johnsgard and Rickard 1957). Because of its relationship to other North American grassland and shrub desert ecosystems, and because of the disappearance of most of the original palouse under grain cultivation (Daubenmire 1970, Franklin and Dyrness 1969), it is especially important to document the structure and dynamics of bird populations in this environment. Our studies, initiated in 1971 as part of the U.S. IBP Grassland Biome Program, have been directed toward determining the species composition, population densities, and standing crop biomass of small "songbirds" (passerines) in mixed palouse-shrubsteppe habitats. These efforts have centered on the Arid Lands Ecology (ALE) Reservation; characteristics of the main study plots, as well as our study techniques, are described in the report of our 1971 IBP studies (Wiens et al. 1972). This report presents results of field studies conducted during late 1972 and 1973 under the support of Battelle-Northwest. The results of our 1972 IBP population studies at ALE are also included, since these have not yet appeared in an IBP Grassland Biome Technical Report.

Plot Population Censuses. Census estimates of the population densities of birds breeding in a 10.6 ha plot located in an area dominated by bunchgrass (*Agropyron-Stipa*) but with moderate *Artemisia* coverage were made in early April and early May 1973. As in 1971 and 1972, the plots were

located immediately adjacent to the grazed and ungrazed treatment plots utilized in other aspects of the IBP study. However, due to the presence of several large structures (notably insect drop traps) in plot 1, we felt it advisable to restrict the 1973 observations to plot 2, since we were uncertain of the modifying influences these structures might have on the bird populations, and we were especially interested in documenting annual changes. The territory mappings of individuals occupying plot 2 in April and May are presented in Appendix I; these mappings served as the basis for estimation of breeding population densities (Table 1).

Several observations may be made from the results presented in Table 1. First, it is apparent that three passerine species, Horned Larks¹, Western Meadowlarks, and Sage Sparrows, dominate the avifauna of this habitat. In 1972 one Brewer's Sparrow occupied a corner of one plot, and transient Savannah Sparrows and White-crowned Sparrows have been recorded on the plots in all censuses, but these are not regular breeding inhabitants of this habitat-type. Second, the between-plot differences noted in 1971 (Wiens et al. 1972) continued in the 1972 samples, with Horned Lark densities lower and Sage Sparrow densities higher in plot 2, which contained somewhat more *Antemisia*. Third, it is apparent that between-year differences in densities and biomass overshadow between-plot differences (Table 2, Fig. 1). Underlying causes of the annual shifts in abundance are difficult to unravel, and are best discerned where data on several aspects of ecosystem dynamics (e.g., climate, primary production,

^{1/} Scientific names of bird species are given in Appendix II.

TABLE 1. Bird species densities and standing crop biomass recorded on 10.6 ha census plots in ungrazed *Agropyron-Stipa-Artemisia* habitat, 1972-1973.

Plot Number	Month	Species	Density (indiv./km ²)		Standing Crop Biomass (g/ha)	
			1972	1973	1972	1973
2	April	Horned Lark	--	154.3	--	48.6
		Western Meadowlark	--	31.4	--	31.5
		Sage Sparrow	--	55.1	--	10.7
		Σ	--	240.8	--	90.8
1	May	Horned Lark	84.3	--	26.8	--
		Western Meadowlark	24.1	--	25.1	--
		Sage Sparrow	78.6	--	15.3	--
		Σ	187.0	--	67.2	--
2	May	Horned Lark	68.8	111.8	21.8	34.6
		Western Meadowlark	36.6	44.3	38.2	44.4
		Sage Sparrow	95.6	74.1	18.6	14.4
		Brewer's Sparrow	4.7	--	0.6	--
		Σ	205.7	230.2	79.2	93.4

Table 2. Annual percentage change (calculated as $\frac{\text{value year } n + 1}{\text{value year } n}$) in density of breeding bird populations at ALE, 1971-1973 (May census only)

Species	Plot	Density	
		1971-72	1972-73
Horned Lark	1	-0.21	--
	2	-0.26	+0.58
Western Meadowlark	1	-0.40	--
	2	-0.22	+0.21
Sage Sparrow	1	+0.16	--
	2	-0.21	-0.22
Total	1	-0.12	--
	2	-0.29	+0.12

Plot 2
 Plot 1

invertebrate biomass) are collected along with the avian censuses over several successive years. Such, of course, is one of the aims of the IBP studies, but to elucidate the factors associated with instability in bird populations may well require more than three annual fixes. Finally, some intra-seasonal changes in species abundances are apparent. Horned Larks, for example, were more abundant in early April than early May, while Meadowlarks and Sage Sparrows increased in abundance during this period. These changes doubtless reflect phenological differences between these species, but again data from several years are necessary to clarify these patterns. The relationships between these phenological differences and dietary characteristics and food "availability" are especially deserving of attention.

Broader Distributional Patterns. In an attempt to place our plot observations in a broader perspective of avian distribution over the ALE Reservation, we conducted informal surveys in nine areas of the reservation during April and May of 1973. In these surveys, an area of relatively uniform habitat-type was selected and three observers wandered separately but aimlessly through this area for 30 minutes, recording the numbers of individuals seen of each species. The locations of these surveys are indicated in Fig. 2, and general features of each are listed in Table 3. The results of these surveys, expressed as numbers of individuals seen per 1.5 man-hours of observation, are presented in Table 3.

The coarse level of quantification of these surveys precludes detailed analyses, but several generalizations do emerge. Horned Larks apparently have a broad altitudinal distribution over the ALE Reservation, attaining

Table 3. Birds recorded by three observers during 1.5 man hours of observations in several habitat types at ALE, 1973.

Station & Description	Species	Number seen/1.5 man-hours	
		April 14-15	May 12-13
1. Sagebrush-bunchgrass 980'	Horned Lark	44	46
	Western Meadowlark	34	23
	Sage Sparrow	33	31
2. Hopsage; sparse; 740'	Horned Lark	39	42
	Crow	1	0
	Chuckar	2	0
	Marsh Hawk	1	0
	Western Meadowlark	11	12
	Sage Sparrow	1	6
	White-crowned Sparrow	1	0
3. Sparse grass; no shrubs; 510'	Barn Swallow	0	1
	Horned Lark	42	1
	Raven	2	Not
	Marsh Hawk	2	Censused
	Western Meadowlark	10	1
4. Agropyron; no shrubs; 1160'	Horned Lark	60	59
	Marsh Hawk	1	0
	Vesper Sparrow	2	0
	Western Meadowlark	27	11
	Sage Sparrow	0	1
	Brewer's Sparrow	0	1
	Barn Swallow	0	1
5. Agropyron; 1950'	Horned Lark	43	1
	Western Meadowlark	14	Not
	Vesper Sparrow	15	Censused
	Chuckar	11	1
	Sage Sparrow	1	1
	Raven	1	1
6. Dense large sage- brush & rabbit- brush, 460'	Horned Lark	0	1
	Western Meadowlark	28	Not
	Sage Sparrow	5	Censused
	Vesper Sparrow	2	1
	Long-billed Curlew	2	1

Table 3. (Continued)

Station & Description	Species	Number seen/1.5 man-hours	
		April 14-15	May 12-13
7. Large sagebrush; 1200'	Horned Lark	11	0
	Western Meadowlark	48	26
	Sage Sparrow	28	19
	Swainson's Hawk	1	0
	Marsh Hawk	1	0
	Magpie	0	3
	Vesper Sparrow	0	1
	Loggerhead Shrike	0	1
8. "Alpine"; 3480'	Horned Lark	1	72
	Western Meadowlark	Not	4
	White-crowned Sparrow	Censused	1
	Golden Eagle	1	1
9. Sagebrush-bunchgrass; 1800'	Horned Lark	1	51
	Western Meadowlark		24
	Mourning Dove	Not	2
	Lark Sparrow	Censused	1
	Coopers Hawk	1	1
	Barn Swallow	1	1

relatively high densities on the crest of Rattlesnake Mountain (Station 8) and in lower elevation sites (Fig. 3). At stations dominated by large sagebrush (i.e., "closed" habitat types, with short vertical visual range), however, Horned Lark densities were quite low. Sage Sparrows occurred in areas in which sagebrush was present, but were virtually absent above 1500 ft. elevation. The surveys suggest that Vesper Sparrows were more abundant at higher elevations, but the observations are too scanty to permit a more definitive determination of this intriguing relationship.

Dietary Composition. In a continuation of our IBP studies on dietary habits of grassland birds (Wiens et al. 1973), several specimens (primarily Horned Larks) were collected on the ALE site in November 1972. Analysis of these specimens has now been completed, but presentation of the results of these collections will be deferred until they can be compared with collections made at ALE in May 1972 as part of the IBP ventures.

Comments. As in 1971 and 1972, our studies indicate the intermediate position of the ALE study area in relation to the range of breeding densities and biomass values recorded in a variety of grassland and shrub-steppe habitats. Annual changes in population densities are of special interest, partially because of their potential effects on ecosystem functioning, partially because of their import for ecological theory. I have suggested (Wiens, ms), for example, that the year-to-year persistence of plant growth forms (e.g., bunchgrasses, *Artemisia*) in palouse and shrub-steppe habitats should mask yearly variations in primary production, which in typical grasslands may be more readily expressed as annual changes

in habitat physiognomy. To the extent that bird populations are sensitive to habitat structure in their settling responses in the spring, these variations in physiognomy should be reflected in variations in population densities and species presence. At ALE the species composition has remained constant over the three years of our plot censuses, although total density, as well as the densities of individual species, have undergone annual fluctuations (Table 2, Fig. 1). The continuing decline in Sage Sparrow abundance from 1971 to 1973 is especially interesting, and deserves more detailed study.

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APPENDIX I

TERRITORY MAPPINGS ON THE ALE SITE, 1972-1973

The following territory mappings summarize individual flushings (Wiens 1969) and are the data from which plot-based population density estimates were derived. Within each territory are two figures: the upper is the area of the portion of the territory within the plot (in hectares); the lower is the proportion of the entire territory lying within the plot. 1971 territory mappings from ALE are presented in Wiens et al. (1972).

KEY TO SPECIES CODE:

AM	BE	Sage Sparrow
ER	AL	Horned Lark
SP	BR	Brewer's Sparrow
ST	NE	Western Meadowlark

1972

SITE: ALE

TREATMENT: Ungrazed

PLOT: 1

SPECIES: ER AL

4.46 territories = 8.92 indiv. = 84.3 indiv./km²

Mean territory size = 3.22 ha (n = 1); percent plot occupied = 90

1972

SITE:

ALE

TREATMENT: Ungrazed

PLOT: 1

SPECIES: ST HE

1.02 territories = 2.55 indiv. = 24.1 indiv./km²
Percent plot occupied = 36

1972

SITE: ALE TREATMENT: Ungrazed PLOT: 1 SPECIES: AM BE

4.16 territories = 8.32 indiv. = 78.6 indiv./km²
Mean territory size = 1.94 ha (n = 3); percent plot occupied = 75

1972

SITE: ALE TREATMENT: Ungrazed PLOT: 2 SPECIES: ER AL

3.64 territories = 7.28 indiv. = 68.8 indiv./km²
Mean territory size = 2.55 ha (n = 2); percent plot occupied = 73

1972

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: ST NE

1.55 territories = 3.88 indiv. = 36.6 indiv./km²

Mean territory size = 5.45 ha (n = 1); percent plot occupied = 68

1.36
37%

1.34
36%

4.49
82%

1972

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: AM BE

5.06 territories = 10.12 indiv. = 95.6 indiv./km²

Mean territory size = 1.28 ha (n = 3); percent plot occupied = 68

1972

SITE: ALE TREATMENT: Ungrazed PLOT: 2 SPECIES: SP BR

0.25 territories = 0.50 indiv. = 4.7 indiv./km²
Percent plot occupied = 6

0.65
25%

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: ER AL

APRIL 14, 1973

8.18 territories = 16.36 indiv. = 154.27 indiv./km²

Mean territory size = 1.33 ha (n = 7); Percent plot occupied = 91

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: ER AL

MAY 13, 1973

5.93 territories = 11.86 indiv. = 111.84 indiv./km²

Mean territory size = 1.61 ha (n = 4); Percent plot occupied = 89

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: ST HE

APRIL 14, 1973

1.33 territories = 3.32 indiv. = 31;35 indiv./km²
Mean territory size = 4.51 ha (n = 1); Percent plot occupied = 57

3.07
67%

2.54
56%

0.25
6%

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: ST NE

MAY 13, 1973

1.88 territories = 4.70 indiv. = 44.32 indiv./km²

Percent plot occupied = 80

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: AM BE

APRIL 14, 197

2.92 territories = 5.84 indiv. = 55.07 indiv./km²
Mean territory size = 2.12 ha (n = 3); Percent plot occupied = 58

2.36
84 %

0.81
38%

1.51
86%

1.45
81%

0.06
3%

SITE: ALE

TREATMENT: Ungrazed

PLOT: 2

SPECIES: AM BE

MAY 13, 1973

3.93 territories = 7.86 indiv. = 74.12 indiv./km²
Mean territory size = 1.95 ha (n = 3); Percent plot occupied = 80

APPENDIX II

Scientific names of bird species mentioned in this report

Species	Scientific Name
Horned Lark	<i>Eremophila alpestris</i>
Western Meadowlark	<i>Sturnella neglecta</i>
Sage Sparrow	<i>Amphispiza belli</i>
Brewer's Sparrow	<i>Spizella brewerii</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Vesper Sparrow	<i>Pooecetes gramineus</i>
Common Crow	<i>Corvus brachyrhynchos</i>
Chuckar	<i>Alectoris graeca</i>
Marsh Hawk	<i>Circus cyaneus</i>
Barn Swallow	<i>Hirundo rustica</i>
Raven	<i>Corvus corax</i>
Long-billed Curlew	<i>Numenius americanus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Magpie	<i>Pica pica</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
Golden Eagle	<i>Aquila chrysaetos</i>
Mourning Dove	<i>Zenaidura macroura</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Coopers Hawk	<i>Accipiter cooperi</i>