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AVIAN ECOLOGY AND DISTRIBUTION IN THE
COMPREHENSIVE NETWORK, 1970

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TABLE OF CONTENTS

	Page
Title Page	i
Table of Contents	ii
Abstract	iii
Introduction	1
Methods	3
Plot Census	3
Roadside Count	4
Food Habits	6
Results	6
Constraints	6
Results	9
Plot censuses	9
Roadside counts	9
Avian weights	9
Food habits	9
Preliminary Discussion	9
Roadside Counts	21
Species distributions	21
Ecological structure	22
Comparisons to plot censuses	22
Plot Censuses	28
Migratory characteristics	28
Site comparisons	31
Treatment comparisons	31
Biomass partitioning	33
Literature Cited	34
Appendix I	35

ABSTRACT

This report presents a summarization and preliminary analysis of data obtained on breeding bird populations at six IBP Grassland Biome Comprehensive Network sites and two plots at the Pawnee Site during the spring and summer of 1970. These data were obtained from roadside counts made in the general vicinity of the sites, from 8.4 to 10.6 ha intensive study plots located in grazing treatment areas at each site, and from specimens collected near the study plots. This report considers these data in terms of: (i) species presence and distributions, (ii) population densities, (iii) standing crop biomass, (iv) individual weights, (v) diversity, (vi) ecological structure of the breeding avifaunas, and (vii) general migratory tendencies of the breeding populations.

INTRODUCTION

The objectives of the research reported here were to determine the abundance of bird species breeding on Comprehensive Network sites of the U.S. IBP Grassland Biome study, and from these population estimates to examine the patterns of regional variation in species presence, densities, standing crop, and ecological differentiation of the avifauna. In addition, an attempt was made to obtain a preliminary indication of the trophic role of the dominant species (in terms of numbers and biomass) through dietary analysis. Specimens collected for this purpose also yielded information on patterns of variation in weight and morphological features. Additional data collected on vegetation structure (see Wiens 1969) and on interspecific spatial relationships are not included in this report.

Not all of the Comprehensive Network sites were included in this study. Dickinson was too small to be effectively sampled, Hopland and Ale were phenologically out of phase with the period during which field work could be conducted, and there was simply not enough time to include Hayes in the project. The remaining sites were all studied, although with varying completeness; the sampling conducted at each site is summarized in Table 1. In addition, two plots at the Pawnee Site which had received attention in 1968 and 1969 (Wiens 1970) were included in the program.

This report includes results and preliminary analyses from the population census work and collection specimen weights (biomass). Analysis of dietary samples is a slow and laborious procedure, and has not been completed at this time; these results will be included in a later technical report.

Table 1. Summarization of avian ecology research conducted on IBP Grassland Biome Comprehensive Sites, 1970.

	Site						
	Jornada	Pantex	Osage	Pawnee	Cotton-wood	Bridger	Bison
Dates Visited	5/29/70-6/1/70	6/3/70-6/7/70	6/12/70-6/15/70	6/20/70-6/23/70	6/25/70-6/28/70	7/2/70-7/3/70	7/5/70-7/6/70
Plot Census ^{a/}	G, U	G, U	G	HS, HW	G, U	G	G
Plot Size (ha)	10.6, 10.6	10.6, 10.3	8.4	10.6, 10.6	10.6, 10.6	10.6	10.6
Roadside Count ^{b/}	2	2	2	0	2	0	0
Specimens Collected	9	38	28	0	48	0	0

^{a/} G = grazed treatment; U = ungrazed or lightly grazed treatment; HS = heavy summer grazing; HW = heavy winter grazing.

^{b/} Number of successive daily counts.

METHODS

Plot Census

At each site, plots for intensive population analysis were established, using a grid (with a 61 m intervals) marked with conspicuous 1 m wooden stakes. In most cases, the plot included 10.6 ha, but in two situations (Pantex ungrazed and Osage grazed) physical restrictions forced the adoption of smaller plots (Table 1). Where possible, a plot was located in each of the two major treatments (grazed and ungrazed or very lightly grazed), but at the Osage, Bridger, and Bison sites ungrazed areas of sufficient size were not available, and only the grazed treatment was studied. At all sites plot locations were determined with the assistance of site personnel, and were centrally located in the available treatment type to reduce the possibility of "edge effect." At Pawnee the plots were situated in locations previously studied in 1968 and 1969 (see Wiens 1970).

The territories of all individuals of all species occurring within the study plot were mapped using the "territory-flush" procedure (Wiens 1969). After selecting a singing individual (presumably a male), its position with respect to the grid markers was marked on a scaled field map of the plot. The individual was then approached until it flushed from its perch, and its flight path and landing position recorded on the map. The bird was then flushed again, and its movements mapped. This procedure was repeated for 25 consecutive flushings, or until a satisfactory mapping of its territory was obtained. A line enclosing the periphery of these movements then was drawn to delimit the territory boundary. Working for 2 to 3 hours in early

morning and evening, the territories of all individuals in a plot could generally be mapped in 1½ to 2 days.

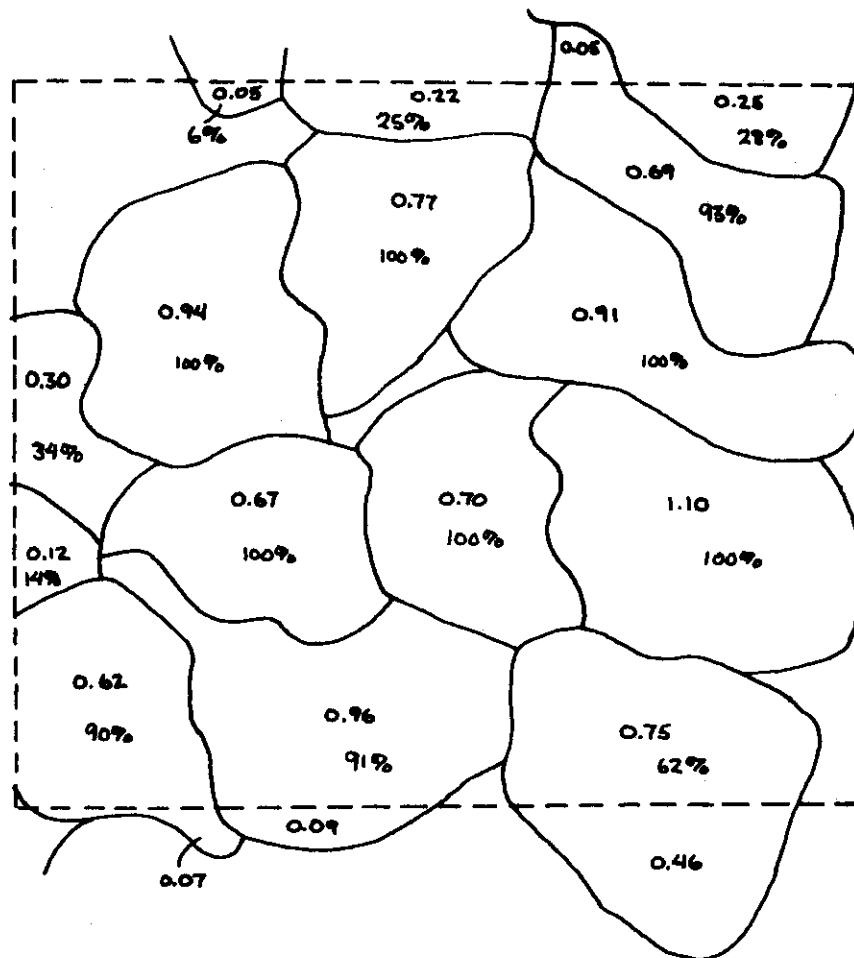
To obtain a plot population census from these territory mappings, it was necessary, for each species, to determine the area of each individual territory, using a acreage grid (Bryan 1943). This not only permitted calculation of territory size characteristics for the species, but allowed a precise determination, for territories lying partially outside the plot, of the proportion occurring within the plot boundaries. For territories which were incompletely mapped, mean territory size for the species at that plot was used to determine the proportion lying within the plot. For each species, the total number of territories and portions of territories lying within the plot boundaries was determined and multiplied by a mating system conversion factor (2.0 for typically monogamous species, 2.5 for typically polygynous species, such as meadowlarks and Dickcissel^{1/}) to obtain the plot census. These values were then standardized and expressed as individuals/100 ha. An example of a summary map and the density calculations for one species at one site is given in Fig. 1.

Roadside Count

Routes for roadside counts of birds in the general area of the sites were selected to include representative grassland habitat of the area. At the Bridger and Bison sites roadside counts were not conducted because of a lack of suitable roads, and at Pawnee such counts are being conducted by Ron Ryder's group.

Counts were run twice at each site, on successive mornings, generally somewhere between 7:00 AM and 11:00 AM local time. Each count consisted of 30

^{1/} Scientific names of all species are given in Tables 5 and 11.



Mean Territory Size = 0.88 ha (n=10)
 Population Census: 10.43 territories $\times$ 2.0
 = 20.86 individuals
 = 196.7 indiv./100ha

Fig. 1. Example of territory flush summary maps from which plot population census values were derived. This map is for Horned Lark occupancy at Pantex (grazed treatment). The value in each territory is its area (ha); the percentage refers to the proportion of the territory lying within the plot boundaries (dashed line). Mating conversion factor = 2.0.

stops, separated by 0.5 miles. At each stop a 0.25 mile-radius circle was scanned for 3 minutes and all birds seen or heard counted. Two observers participated in the census, each converging 180° of the circle. Stops occurring in non-grassland habitat (riparian woods, farm yards, ponds, etc.) were skipped, but in all counts a total of 30 suitable stops were recorded. No censuses were run in inclement or windy weather.

Food Habits

To make initial determinations of the trophic roles of the dominant species at each site, specimens were collected, by shotgun. Specimens were collected from plots similar to the grazed study plots, but at least 0.5 km away. Upon collection, each specimen was immediately treated by inserting a cotton plug in the mouth, opening a small incision on the belly, and injecting the stomach and gizzard with a measured amount of 5% Formalin. Within an hour the specimens were taken to a field lab, weighed (after removal of the cotton mouth plug and adjustment for the weight of the injected Formalin), and the stomach, gizzard, and lower portion of the esophagus removed and preserved in 5% Formalin. Various external and internal measurements were then recorded (see IBP Grassland Biome Technical Report No. 35).

All specimens were collected in the early morning or late afternoon hours, during the active feeding periods. Sample sizes are given in Table 1.

RESULTS

Constraints

A major restriction of this study is its temporal limitation. At any local site there are seasonal fluctuations in the abundance and presence

of species (e.g., as at Pawnee--see Giezentanner and Ryder 1969), and to assess adequately the relationships between sites, such temporal changes should be considered. But the avian breeding season on grasslands is relatively short, and in order to determine breeding populations at several sites, each site could be visited only once. Since studies at each site could be conducted at only one time, t , during the season, it was decided to sample each site as close to the peak of the local breeding season as possible (i.e., following the pre-breeding influx of migrants and prior to the post-breeding addition of young birds to the population--see Fig. 2). In support of this approach, I would suggest that this is the time of greatest population stability, wedged between two increases. Further, it is the population level which indicates most closely the "carrying capacity" or supportive capabilities of the local site conditions, since migratory wave densities may be largely unrelated to local conditions. And, given that this period represents a "plateau" of relative stability of the breeding population, it should provide the most appropriate time at which to obtain a fix on yearly variations. Still, there are obvious limitations in this approach, and the data reported below should be considered with this temporal constraint in mind. Further, while breeding activity and the absence of wandering migrants or fledglings at most sites were indications that our sampling did fall somewhere in this "plateau," for some species (e.g., the Horned Lark, with a prolonged breeding season) breeding had undoubtedly commenced well before the sampling, and for other species (e.g., shrikes at Jornada, Upland Plovers at Osage, Long-billed Curlews at Cottonwood) juvenile birds were included among the specimens collected.

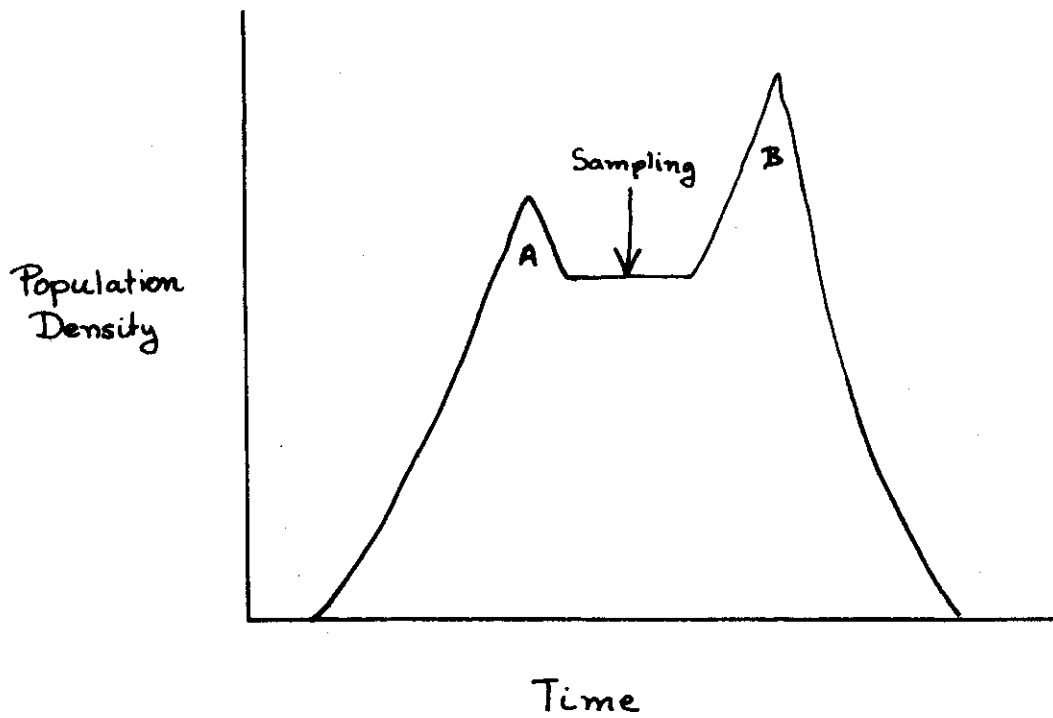


Fig. 2. Hypothetical seasonal variation in abundance of a migratory species on a grassland plot. A indicates the early influx of migrants, B the post-breeding increase in population density resulting from recruitment and passage of migrants. In this study we attempted to conduct sampling during the relatively stable breeding "plateau" (arrow).

Results

Plot censuses. The results of the plot censuses are presented in Table 2, and are summarized in Tables 4 and 5. Weight values used for the calculation of standing crop biomass are given in Table 3. The species and biomass diversities given in Table 4 were calculated by:

$$H' = -\sum p_i \log_e p_i$$

where, p_i = specified variable for i^{th} species/specified variable for all species combined and,

$$H'_{\text{MAX}} = \log_e S$$

where, S = the number of species.

Roadside counts. Results of the daily and combined roadside counts taken at Jornada, Pantex, Osage, and Cottonwood are presented in Tables 6 through 9 and Fig. 3.

Avian weights. Wet weight values for the specimens collected for dietary analysis are summarized in Table 10.

Food habits. The stomach samples are currently being analyzed, but results are not available at this time.

PRELIMINARY DISCUSSION

While intensive analysis and interpretation of the results obtained in this study cannot be undertaken until other information from the study sites (e.g., insect abundance, primary production rates) is available, some "first-run" analyses have been undertaken, and these indicate something of the

Table 2. Plot census results from the grassland sites studied in this project. Standing crop biomass values were obtained using the weights given in Table 3.

Site	Treatment	Species	Plot Census ^a	Birds/ 100 ha	Area Occupied (ha) ^b	Territory Size(ha) ^c	Standing Crop Biomass(g/ha)
Jornada	Grazed	Scaled Quail	0.20	1.9	*	*	3.8
		Mockingbird	1.40	13.2	1.7(16)	*	6.6
		Loggerhead Shrike	0.50	4.7	1.3(13)	*	2.3
		Total		19.8			12.7
	Ungrazed	Western Kingbird	0.40	3.8	0.8(7)	*	1.4
		Ash-throated Flycatcher	0.80	7.5	4.5(42)	*	2.1
		Cactus Wren	0.10	0.9	0.1(1)	*	0.3
		Mockingbird	0.70	6.6	2.1(20)	*	1.0
		Total		18.8			4.8
Pantex	Grazed	Horned Lark	20.86	196.7	9.1(85)	0.88(10)	63.3
		Western Meadow- lark	5.28	49.8	4.7(44)	2.31(2)	49.1
		Lark Bunting	0.30	2.8	0.2(1)	*	1.0
		Grasshopper Sparrow	1.80	17.0	0.8(8)	*	2.9
		Total		266.3			116.3
	Ungrazed	Horned Lark	12.38	120.2	6.5(63)	1.05(7)	38.7
		Western Meadow- lark	7.27	70.6	6.6(64)	2.24(3)	69.6
		Lark Bunting	0.20	1.9	0.1(1)	*	0.7
		Grasshopper Sparrow	2.00	19.4	0.6(6)	0.61(1)	3.3
		Total		212.1			112.3
Osage	Grazed	Upland Plover	0.80	9.5	2.3(27)	*	12.2
		Eastern Meadow- lark	7.42	88.3	6.7(80)	2.04(2)	86.6
		Dickcissel	6.80	80.9	4.0(48)	1.49(2)	22.2
		Grasshopper Sparrow	6.00	71.4	2.5(30)	0.83(3)	12.0
		Total		250.1			133.0
Pawnee	Heavy Summer	Mountain Plover	0.50	4.7	2.0(19)	*	5.3
		Nighthawk	0.70	6.6	2.3(22)	*	5.0
		Horned Lark	14.42	136.0	8.7(82)	1.20(6)	43.9
		Western Meadow- lark	1.0	9.4	1.0(9)	*	10.3
		Lark Bunting	3.96	37.3	2.7(25)	*	13.3
		McCowan's Longspur	8.02	75.6	6.1(57)	1.41(3)	19.0
		Total		269.6			96.8
	Heavy Winter	Horned Lark	12.18	114.9	6.2(58)	1.04(7)	37.1
		Lark Bunting	14.46	136.4	7.6(71)	1.01(7)	48.6
		Brewer's Sparrow	2.74	25.8	1.1(11)	0.94(2)	3.1
		Total		277.1			88.8

not wet

Table 2. (Continued)

Site	Treatment	Species	Plot Census ^{a/}	Birds/ 100 ha	Area Occupied (ha) ^{b/}	Territory Size (ha) ^{c/}	Standing Crop Biomass(g/ha)
Cottonwood	Grazed	Horned Lark	13.86	130.7	7.4(70)	1.07(6)	41.6
		Western Meadow-					
		lark	1.87	17.6	3.2(30)	*	17.7
		Grasshopper Sparrow	0.40	3.8	0.2(2)	*	0.7
		Total		152.1			60.0
	Ungrazed	Upland Plover	1.50	14.1	3.4(32)	4.50(1)	18.1
		Long-billed Curlew	1.68	15.8	5.8(54)	*	93.5
		Horned Lark	5.16	48.7	4.2(40)	1.62(2)	15.5
		Western Meadow-					
		lark	7.75	73.1	7.7(72)	2.52(3)	73.7
		Grasshopper Sparrow	16.32	153.9	6.7(63)	0.82(6)	26.9
		Chestnut-collared Longspur	0.50	4.7	0.2(2)	*	0.9
		Total		310.3			228.6
Bridger	Grazed	Robin	2.24	21.1	5.5(52)	*	16.6
		Mountain Bluebird	1.68	15.8	3.6(34)	*	4.9
		Horned Lark	1.92	18.1	2.7(26)	2.82(1)	5.8
		Vesper Sparrow	5.70	53.8	5.6(53)	1.96(3)	12.8
		Total		108.8			40.1
Bison	Grazed	Western Meadow-					
		lark	6.73	63.5	8.6(81)	*	64.0
		Vesper Sparrow	0.76	7.2	0.7(7)	*	1.7
		Grasshopper Sparrow	7.82	73.7	3.8(35)	0.96(3)	12.9
		Total		144.4			78.6

^{a/} individuals/study plot

^{c/} sample size in parentheses

^{b/} per cent of study plot in parentheses

* no data

Table 3. Mean wet weight values of grassland bird species used in the determinations of standing crop biomass. For values from this study, the mean weights of females and males for a species (Table 10) were averaged.

Species	Mean Weight (g)	Sites Used	Authority
Upland Plover	128.7	All	This study
Long-billed Curlew	591.5	All	This study
Mountain Plover	113.0	All	Giezentanner and Ryder 1969
Scaled Quail	197.9	All	Amadon 1943
Nighthawk	75.0	All	Lasiewski and Dawson 1964
Ash-throated Flycatcher	27.6	All	This study
Western Kingbird	38.1	All	This study
Horned Lark	32.3	Pawnee	Giezentanner and Ryder 1969
	31.8	Cottonwood, Bridger	This study
	32.2	Pantex	This study
Cactus Wren	38.7	All	This study
Robin	78.7	All	Hartman 1955
Mountain Bluebird	31.0	All	Hartman 1955
Mockingbird	49.7	All	Hartman 1955
Loggerhead Shrike	48.6	All	Grinnell 1923, Hartman 1955, Norris and Johnston 1958
Eastern Meadowlark	98.1	All	This study
Western Meadowlark	100.8	Cottonwood, Bison	This study
	110.0	Pawnee	Giezentanner and Ryder 1969
	98.6	Pantex	This study
Dickcissel	27.5	All	This study
Lark Bunting	35.6	All	Baldwin, personal communication
Grasshopper Sparrow	17.5	Cottonwood, Bison	This study
	16.8	Osage, Pantex	This study
Vesper Sparrow	23.7	All	Baldwin and Kendeigh 1938
			Grinnell 1923, Amadon 1943
Brewer's Sparrow	12.0	All	Giezentanner and Ryder 1969
McCowan's Longspur	25.1	All	Giezentanner and Ryder 1969
Chestnut-collared Longspur	18.6	All	This study

Table 4. Summary of plot census results and plot diversities, IBP Grassland Biome Comprehensive sites, 1970.

Site ^{a/}	Number of species	Density (indiv/100ha)	Standing Crop Biomass (g/ha)	Species Diversity		Biomass Diversity	
				$\frac{H'}{H'_{MAX}}$	$\frac{H'/H'_{MAX}}{H'/H'_{MAX}}$	$\frac{H'}{H'_{MAX}}$	$\frac{H'/H'_{MAX}}{H'/H'_{MAX}}$
Jornada G	3	19.8	12.7	0.865	1.099	0.993	1.099
Jornada U	4	18.8	4.8	1.060	1.386	1.332	1.386
Pantex G	4	266.3	116.3	0.742	1.385	0.831	1.386
Pantex U	4	212.1	112.3	0.949	1.386	0.753	1.386
Osage G	4	250.1	133.0	1.219	1.386	1.009	1.386
Pawnee HS	6	269.6	96.8	1.256	1.792	1.534	1.792
Pawnee HW	3	277.1	88.8	0.936	1.099	0.808	1.099
Cottonwood G	3	152.1	60.0	0.443	1.099	0.611	1.099
Cottonwood U	6	310.3	228.6	1.321	1.792	1.386	1.792
Bridger G	4	108.8	40.1	1.244	1.386	1.181	1.386
Bison G	3	144.4	78.6	0.815	1.099	0.561	1.099

^{a/} G= grazed, U=ungrazed or lightly grazed, HS= heavy summer grazing, HW= heavy winter grazing

Table 5. Relative Densities of breeding birds on IBP grassland plots, 1970. Scientific names not given here are listed in Table 11. G = grazed, U = ungrazed, HW = heavy winter grazing, HS = heavy summer grazing.

Species	Jornada G	Jornada U	Pantex G	Pantex U	Osege G	Pawnee HW	Pawnee HS	Cottonwood G	Cottonwood U	Bridger G	Bison G
Upland Plover					●				●		
Long-billed Curlew									●		
Mountain Plover (<u>Eupoda montana</u>)							●				
Scaled Quail	●										
Nighthawk							●				
Ash-throated Flycatcher		●									
Western Kingbird		●									
Horned Lark			●	●		●	●	●	●	●	
Cactus Wren		●									
Robin										●	
Mountain Bluebird (<u>Sialia currucoides</u>)										●	
Mockingbird	●	●									
Loggerhead Shrike	●										
Eastern Meadowlark					●						
Western Meadowlark			●	●			●	●	●		●
Dickcissel					●						
Lark Bunting			●	●		●	●				
Grasshopper Sparrow			●	●	●			●	●		●
Vesper Sparrow (<u>Poocetes gramineus</u>)										●	●
Brewer's Sparrow (<u>Spizella breweri</u>)						●					
McCowan's Longspur (<u>Rhynchophanes mccownii</u>)							●				
Chestnut-collared Longspur									●		

● = 20 birds/100ha

● = 20-50 birds/100ha

● = 50-125 birds/100ha

● = 125 birds/100ha

Table 6 . Results of roadside counts taken at the Jornada site. Comb. = combined census results. Species codes are given in Table 11.

Species	Birds/Stop ^{a/}			Birds/Stop (Total) ^{b/}			Frequency ^{c/}		
	5/30/70	5/31/70	Comb.	5/30/70	5/31/70	Comb.	5/30/70	5/31/70	Comb.
CA AU	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
BU SW	2.00	1.00	1.50	0.07	0.07	0.07	0.03	0.07	0.03
AQ CH	1.00	1.00	1.00	0.07	0.07	0.07	0.07	0.07	0.07
CA SQ	1.00	1.50	1.25	0.10	0.10	0.10	0.10	0.07	0.07
AS FL	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
ZE MA	1.00	0.00	0.50	0.13	0.00	0.07	0.13	0.00	0.07
TY VE	1.86	1.10	1.48	0.43	0.37	0.40	0.23	0.33	0.27
MY CI	1.37	1.27	1.32	0.37	0.47	0.42	0.27	0.37	0.30
CA BR	1.00	1.00	1.00	0.03	0.03	0.03	0.03	0.03	0.03
CO CO	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
MI PO	1.47	1.73	1.60	0.83	0.87	0.85	0.57	0.50	0.53
TO CU	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
LA LU	1.33	1.37	1.35	0.40	0.73	0.57	0.30	0.53	0.40
IC PA	1.00	1.00	1.00	0.10	0.03	0.07	0.10	0.03	0.07
TOTAL				2.67	2.73	2.70			

^{a/} Number of individuals recorded ÷ number of stops at which species was recorded

^{b/} Number of individuals recorded ÷ total number of stops (=30)

^{c/} Number of stops at which species was recorded ÷ total number of stops (=30)

Table 7 . Results of roadside counts taken at the Pantex site. Comb. = combined census results.

Species	Birds/Stop ^{a/}			Birds/Stop (Total) ^{b/}			Frequency ^{c/}		
	6/5/70	6/6/70	Comb.	6/5/70	6/6/70	Comb.	6/5/70	6/6/70	Comb.
CA AU	2.00	0.00	1.00	0.07	0.00	0.03	0.03	0.00	0.02
BU JA	0.00	1.00	0.50	0.00	0.03	0.02	0.00	0.03	0.02
BU SW	1.00	2.00	1.50	0.03	0.07	0.05	0.03	0.03	0.03
CI CY	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
FA SP	1.00	1.00	1.00	0.07	0.03	0.05	0.07	0.03	0.03
CA SQ	1.00	1.00	1.00	0.07	0.07	0.07	0.07	0.07	0.07
CO VI	1.00	1.00	1.00	0.03	0.03	0.03	0.03	0.03	0.03
CH VO	1.50	1.50	1.50	0.10	0.10	0.10	0.07	0.07	0.07
ZE MA	2.60	2.50	2.55	1.30	1.67	1.47	0.50	0.67	0.57
CH MI	2.00	1.75	1.87	0.13	0.23	0.18	0.07	0.13	0.10
TY VE	1.17	0.00	0.58	0.23	0.00	0.12	0.20	0.00	0.10
MU FO	0.00	1.50	0.75	0.00	0.10	0.05	0.00	0.07	0.03
ER AL	4.57	4.71	4.64	2.13	2.67	2.40	0.47	0.57	0.50
HI RU	3.60	4.17	3.88	0.60	0.83	0.70	0.17	0.20	0.17
MI PO	2.29	1.17	1.73	0.53	0.23	0.38	0.23	0.20	0.20
LA LU	0.00	1.00	0.50	0.00	0.03	0.02	0.00	0.03	0.02
ST NE	5.50	5.13	5.32	5.50	5.13	5.32	1.00	1.00	1.00
AG PH	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
MO AT	2.00	2.00	2.00	0.07	0.13	0.10	0.03	0.07	0.03
PO GR	1.50	1.00	1.25	0.10	0.13	0.11	0.07	0.13	0.10
AI CA	4.72	4.65	4.69	3.93	3.57	3.73	0.83	0.77	0.80
AM SA	1.50	1.00	1.25	0.10	0.07	0.08	0.07	0.07	0.07
TOTAL				14.17	15.13	14.65			

^{a/} Number of individuals recorded ÷ number of stops at which species was recorded

^{b/} Number of individuals recorded ÷ total number of stops (=30)

^{c/} Number of stops at which species was recorded ÷ total number of stops (=30)

Table 8. Results of roadside counts taken at the Osage site, Comb. = combined census results.

Species	<u>Birds/stop</u> ^{a/}			<u>Birds/Stop (Total)</u> ^{b/}			<u>Frequency</u> ^{c/}		
	6/13/70	6/14/70	Comb.	6/13/70	6/14/70	Comb.	6/13/70	6/14/70	Comb.
CI CY	1.00	1.00	1.00	0.10	0.10	0.10	0.10	0.10	0.10
CA AU	0.00	1.00	0.50	0.00	0.03	0.02	0.00	0.03	0.02
BU VI	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
AR HE	1.00	1.00	1.00	0.03	0.10	0.07	0.03	0.10	0.07
CO VI	1.17	4.00	2.58	0.23	0.13	0.18	0.20	0.03	0.10
TY CU	0.00	3.00	1.50	0.00	0.10	0.05	0.00	0.03	0.02
CH VO	2.00	1.50	1.75	0.20	0.20	0.20	0.10	0.13	0.10
BA LO	3.39	2.83	3.11	2.60	2.27	2.43	0.77	0.80	0.77
ZE MA	2.14	1.83	1.99	0.50	0.37	0.43	0.23	0.20	0.20
CH MI	1.75	1.00	1.37	0.23	0.03	0.13	0.13	0.03	0.07
TY TY	1.40	1.50	1.45	0.23	0.30	0.27	0.17	0.20	0.17
TY VE	1.00	0.00	0.50	0.03	0.00	0.02	0.03	0.00	0.02
MU FO	1.00	2.00	1.50	0.13	0.20	0.17	0.13	0.10	0.10
ER AL	2.00	1.25	1.62	0.40	0.17	0.28	0.20	0.13	0.17
HI RU	2.60	3.83	3.22	0.87	0.77	0.82	0.33	0.20	0.27
PE PY	5.50	4.00	4.75	0.37	0.27	0.32	0.07	0.07	0.07
ST RU	3.00	0.00	1.50	0.10	0.00	0.05	0.03	0.00	0.02
CO BR	0.00	1.00	0.50	0.00	0.03	0.02	0.00	0.03	0.02
MI PO	1.00	1.00	1.00	0.07	0.13	0.10	0.07	0.13	0.10
LA LU	1.00	1.50	1.25	0.03	0.10	0.07	0.03	0.07	0.03
ST MA	8.07	7.40	7.73	8.07	7.40	7.73	1.00	1.00	1.00
ST NE	1.00	1.33	1.17	0.03	0.13	0.07	0.03	0.10	0.07
AG PH	2.75	3.10	2.92	1.83	1.03	1.43	0.67	0.33	0.50
QU QU	1.60	2.89	2.24	0.27	0.87	0.57	0.17	0.30	0.23
MO AT	3.00	0.00	1.50	0.10	0.00	0.05	0.03	0.00	0.02
IC SP	2.00	0.00	1.00	0.07	0.00	0.03	0.03	0.00	0.02
SP AM	7.07	7.47	7.27	7.07	7.47	7.27	1.00	1.00	1.00
AM SA	4.57	4.36	4.46	4.57	4.07	4.32	1.00	0.93	0.97
Total				28.17	26.27	27.21			

^{a/} Number of individuals recorded : number of stops at which species was recorded.

^{b/} Number of individuals recorded : total number of stops (= 30).

^{c/} Number of stops at which species was recorded : total number of stops (= 30).

Table 9. Results of roadside counts taken at the Cottonwood site. Comb. = combined census results.

Species	Birds/Stop ^{a/}			Birds/Stop (Total) ^{b/}			Frequency ^{c/}		
	6/26/70	6/27/70	Comb.	6/26/70	6/27/70	Comb.	6/26/70	6/27/70	Comb.
AN PL	2.50	2.00	2.25	0.17	0.07	0.13	0.07	0.03	0.03
BU JA	1.00	1.00	1.00	0.03	0.10	0.07	0.03	0.10	0.07
BU SW	0.00	1.00	0.50	0.00	0.03	0.02	0.00	0.03	0.02
FA SP	1.00	1.00	1.00	0.03	0.03	0.03	0.03	0.03	0.03
PH CO	1.00	1.00	1.00	0.07	0.03	0.05	0.07	0.03	0.03
CH VO	1.50	2.60	2.05	0.10	0.43	0.27	0.07	0.17	0.10
BA LO	1.33	1.62	1.48	0.13	0.43	0.28	0.10	0.27	0.17
NU AM	1.80	2.20	2.00	0.30	0.37	0.33	0.17	0.17	0.17
ZE MA	1.89	1.44	1.67	0.57	0.43	0.50	0.30	0.30	0.30
TY TY	1.00	1.25	1.12	0.03	0.17	0.10	0.03	0.13	0.07
TY VE	1.62	1.14	1.38	0.43	0.27	0.35	0.27	0.23	0.23
ER AL	3.90	3.56	3.73	2.60	2.97	2.78	0.67	0.83	0.73
HI RU	1.67	3.33	2.50	0.33	0.33	0.33	0.20	0.10	0.13
PE PY	1.50	2.33	1.92	0.10	0.23	0.17	0.07	0.10	0.07
TO RU	1.00	1.00	1.00	0.10	0.03	0.07	0.10	0.03	0.07
TU MI	2.00	0.00	1.00	0.13	0.00	0.07	0.07	0.00	0.03
ST VU	0.00	1.00	0.50	0.00	0.03	0.02	0.00	0.03	0.02
ST NE	6.77	7.47	7.12	6.77	7.47	7.12	1.00	1.00	1.00
AG PH	5.09	4.19	4.64	3.90	2.93	3.42	0.77	0.70	0.73
QU QU	1.00	2.00	1.50	0.03	0.20	0.12	0.03	0.10	0.07
MO AT	1.50	3.00	2.25	0.10	0.10	0.10	0.07	0.03	0.03
CH GR	2.00	1.00	1.50	0.07	0.07	0.07	0.03	0.07	0.03
AM SA	2.50	3.06	2.78	1.34	1.63	1.48	0.53	0.53	0.53
CA ME	2.75	3.60	3.17	1.10	0.60	0.85	0.40	0.17	0.27
CA OR	2.33	2.00	2.17	0.70	0.87	0.80	0.30	0.43	0.37
TOTAL				19.13	19.83	19.48			

^{a/} Number of individuals recorded : number of stops at which species was recorded.

^{b/} Number of individuals recorded : total number of stops (= 30).

^{c/} Number of stops at which species was recorded : total number of stops (= 30).

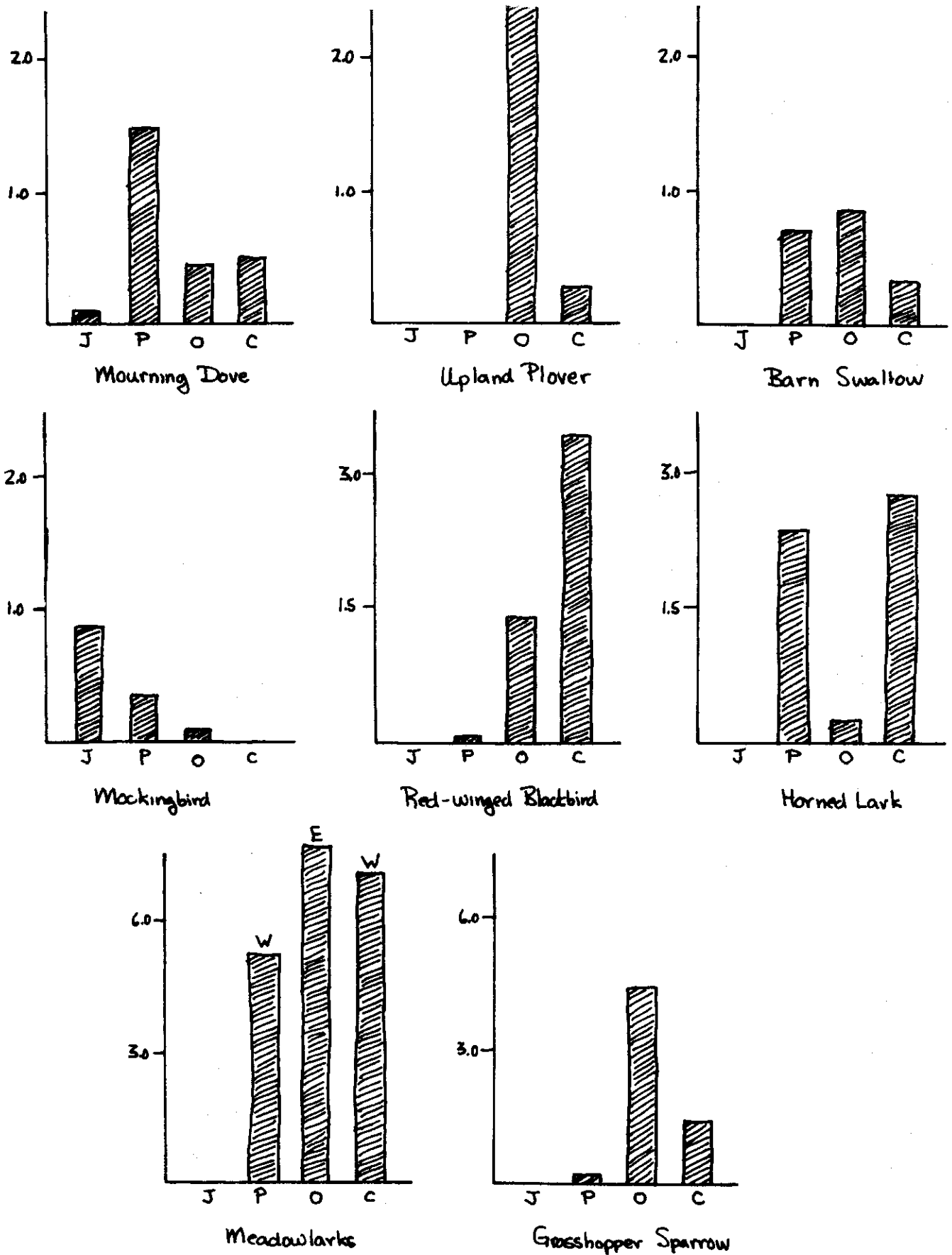


Fig. 3. Variations in abundance of some of the dominant species recorded in the roadside counts. Values on the ordinate are mean density (birds/census stop); plots are indicated on the abscissa (J = Jornada, P = Pantex, O = Osage, C = Cottonwood). For the meadowlarks, W = Western Meadowlark, E = Eastern Meadowlark.

Table 10. Wet weights for adults collected on four grassland sites.

Site	Species	Sex	Weight (g)		N
			Mean	Standard Deviation	
Jornada	Western Kingbird	♂	38.1	0.99	2
	Ash-throated Flycatcher	♂	27.6	0.50	3
	Cactus Wren	♂	38.7	0.00	1
	Scott's Oriole	♂	36.7	0.00	1

Pantex	Horned Lark	♀	30.1	2.15	9
		♂	32.3	1.33	16
	Western Meadowlark	♀	90.4	9.50	10
		♂	106.7	0.50	2

Osage	Upland Plover	♂	128.7	0.00	1
	Eastern Meadowlark	♀	84.9	10.67	3
		♂	111.2	6.82	7
	Dickcissel	♀	25.5	0.71	2
		♂	29.5	1.80	9
	Grasshopper Sparrow	♀	17.0	0.00	1
		♂	16.6	0.51	3

Cottonwood	Long-billed Curlew	♀	591.5	0.00	1
	Horned Lark	♀	31.3	1.60	9
		♂	32.4	1.62	14
	Western Meadowlark	♀	89.9	7.81	4
		♂	111.7	6.37	7
	Grasshopper Sparrow	♀	18.2	0.57	2
		♂	16.7	1.28	5
	Chestnut-collared Longspur	♀	17.9	0.78	2
♂		19.4	0.78	2	

ecological structure of the breeding bird populations and the patterns of local and regional variation.

Roadside Counts

Species distributions. The roadside counts provide a rough index of species abundance and an indication of species composition for a larger area than the plot censuses, but are subject to a number of limitations (see Robbins and Van Velzen 1967). Perhaps the most important of these is the bias introduced by inherent differences in conspicuousness between species. Still, the counts do provide a useful indication of site-to-site variation in the abundance of individual species (with the assumption that the conspicuousness of a species is roughly the same everywhere, and that variations in count values are therefore a measure of variations in abundance rather than artifacts of conspicuousness variations). In addition, the number of species recorded and total counts (Birds/stop) are probably good indicators of the degree of avifaunal "development" or complexity of a site area. The general similarity of the counts taken on successive days (Tables 6 through 9) provide a satisfying indication of the relatively small amount of observation error.

The roadside count results (Tables 6 through 9) indicate that a relatively small number of species dominate the counts. Further, it is apparent that few species are shared with Jornada by the other sites, while there are general similarities in the species lists from Pantex, Osage, and Cottonwood. Osage is the "richest" site, both in number of species and total count (birds/stop), while Jornada is markedly depauperate in comparison with the others. Some additional indications of the patterns of distribution and abundance of some of the dominant species in these counts are given in Fig. 3.

Ecological structure. Strictly systematic comparisons of widely separated areas are not always the most enlightening, and to gain some additional perspective on site relationships, comparisons were made by categorizing each species ecologically according to size, feeding location, and feeding behavior (Table 11). Results of this analysis are given in Table 12 and are summarized in Fig. 4 and 5.

This analysis also indicated the distinctiveness of the Jornada Site, where small ground-feeding species are entirely absent and most individuals are roadside-brush inhabitants (actually here entirely brush species) or air-feeders (flycatchers--these also quite dependent on brush or shrubs in their foraging ecology). The other three sites are generally similar, with small ground feeders predominating, and, particularly at Cottonwood, roadside-brush species (essentially roadside species here) contributing most of the remaining count. Raptors, nowhere very abundant, are considerably more common at Jornada than in the true grassland sites.

Comparisons to plot censuses. Efforts were made during sampling to locate plots in areas representative of the site treatments, and to locate the route for the roadside counts in grassland habitat typical for the area. A comparison of plot and roadside census results for the species which were encountered in both (Table 13) permits several observations. First, while plot censuses were designed (at least partially) to indicate within-site differences with respect to grazing intensity, the roadside counts were clearly incapable of making this distinction--in all areas the habitat covered in the roadside counts was grazed to varying degrees. Second, differences attributable to interspecific differences in conspicuousness are apparent--witness the

Table 11. Listing of species recorded in roadside counts, arranged according to ecological category.

Category	Code	Species
Large Raptor	CI CY	Marsh Hawk (<i>Circus cyaneus</i>)
	BU JA	Red-tailed Hawk (<i>Buteo jamaicensis</i>)
	BU SW	Swainson's Hawk (<i>Buteo swainsoni</i>)
	FA SP	Sparrow Hawk (<i>Falco sparverius</i>)
	AQ CH	Golden Eagle (<i>Aquila chrysaetos</i>)
	AS FL	Short-eared Owl (<i>Asio flammeus</i>)
Small Raptor	LA LU	Loggerhead Shrike (<i>Lanius ludovicianus</i>)
Scavenger	CA AU	Turkey Vulture (<i>Cathartes aura</i>)
Aquatic	BU VI	Green Heron (<i>Butorides virescens</i>)
	AR HE	Great Blue Heron (<i>Ardea herodias</i>)
	AN PL	Mallard (<i>Anas platyrhynchos</i>)
Roadside-Brush	CH VO	Killdeer (<i>Chadrius vociferus</i>)
	CA BR	Cactus Wren (<i>Campylorhynchus brunneicapillum</i>)
	TU MI	Robin (<i>Turdus migratorius</i>)
	MI PO	Mockingbird (<i>Mimus polyglottis</i>)
	TO RU	Brown Thrasher (<i>Toxostoma rufum</i>)
	TO CU	Curve-billed Thrasher (<i>Toxostoma curvirostre</i>)
	ST VU	Starling (<i>Sturnus vulgaris</i>)
	AG PH	Red-winged Blackbird (<i>Agelaius phoeniceus</i>)
	QU QU	Grackle (<i>Quiscalus quiscula</i>)
	MO AT	Cowbird (<i>Molothrus ater</i>)
	IC SP	Orchard Oriole (<i>Icterus spurius</i>)
	IC PA	Scott's Oriole (<i>Icterus parisorum</i>)
Air-Swoop Feed	CH MI	Nighthawk (<i>Chordeiles minor</i>)
	HI RU	Barn Swallow (<i>Hirundo rustica</i>)
	PE PY	Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)
	ST RU	Rough-winged Swallow (<i>Stelgidopteryx ruficollis</i>)
Air-Flycatching	TY TY	Eastern Kingbird (<i>Tyrannus tyrannus</i>)
	TY VE	Western Kingbird (<i>Tyrannus verticalis</i>)
	MU FO	Scissortailed Flycatcher (<i>Muscivora forficata</i>)
	MY CI	Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)
Ground Shorebird	BA LO	Upland Plover (<i>Bartramia longicauda</i>)
	NU AM	Long-billed Curlew (<i>Numenius americana</i>)
Large Ground	CO VI	Bobwhite Quail (<i>Colinus virginianus</i>)
	TY CU	Greater Prairie Chicken (<i>Tympanuchus cupido</i>)
	PH CO	Pheasant (<i>Phasianus colchicus</i>)
	CA SQ	Scaled Quail (<i>Callipepla squamata</i>)
Small Ground	ER AL	Horned Lark (<i>Eremophila alpestris</i>)
	ST MA	Eastern Meadowlark (<i>Stunella magna</i>)
	ST NE	Western Meadowlark (<i>Stunella neglecta</i>)
	SP AM	Dickcissel (<i>Spiza americana</i>)
	CH GR	Lark Sparrow (<i>Chondestes grammacus</i>)
	CA ME	Lark Bunting (<i>Calamospiza melanocorys</i>)
	AM SA	Grasshopper Sparrow (<i>Ammodramus savannarum</i>)
	CA OR	Chestnut-collared Longspur (<i>Calcarius ornatus</i>)
Miscellaneous	ZE MA	Mourning Dove (<i>Zenaidura macroura</i>)
	CO BR	Crow (<i>Corvus brachyrhynchos</i>)
	CO CO	Raven (<i>Corvus corax</i>)

Table 12. Incidence (number of individuals/stop) and proportions (per cent of total count, in parentheses) of various ecological categories (see Table 11) recorded in roadside counts.

Site	Date	Ecological Category										
		Large Raptor	Small Raptor	Scavenger	Aquatic	Roadside-Brush	Air-swoop Feed	Air-flycatch	Ground shorebird	Large Ground	Small Ground	Miscellaneous
OSAGE	6/13/70	0.10 (*)	0.03 (*)	-	0.07 (*)	2.53 (9)	1.57 (6)	0.40 (1)	2.60 (9)	0.23 (1)	20.13 (71)	0.50 (2)
	6/14/70	0.10 (*)	0.10 (*)	0.03 (*)	0.10 (*)	2.23 (8)	1.07 (4)	0.50 (2)	2.27 (9)	0.23 (1)	19.23 (73)	0.40 (2)
	TOTAL	0.10 (*)	0.07 (*)	0.02 (*)	0.09 (*)	2.38 (9)	1.32 (5)	0.46 (2)	2.43 (9)	0.23 (1)	19.67 (72)	0.45 (2)
COTTONWOOD	6/26/70	0.07 (*)	-	-	0.17 (1)	4.36 (23)	0.43 (2)	0.46 (2)	0.43 (2)	0.07 (*)	12.58 (66)	0.57 (3)
	6/27/70	0.16 (1)	-	-	0.07 (*)	3.72 (19)	0.56 (3)	0.44 (2)	0.80 (4)	0.03 (*)	13.61 (69)	0.43 (2)
	TOTAL	0.12 (1)	-	-	0.13 (1)	4.07 (21)	0.50 (3)	0.45 (2)	0.61 (3)	0.05 (*)	13.10 (67)	0.50 (3)
JORNADA	5/30/70	0.17 (6)	0.40 (15)	0.03 (1)	-	0.99 (37)	-	0.80 (30)	-	0.10 (4)	-	0.16 (6)
	5/31/70	0.14 (5)	0.73 (27)	-	-	0.93 (34)	-	0.84 (31)	-	0.10 (4)	-	-
	TOTAL	0.16 (6)	0.57 (21)	0.02 (1)	-	0.97 (36)	-	0.82 (30)	-	0.10 (4)	-	0.09 (3)
PANTEX	6/5/70	0.13 (1)	-	0.07 (*)	-	0.73 (5)	0.73 (5)	0.23 (2)	-	0.10 (1)	11.76 (83)	1.30 (9)
	6/6/70	0.13 (1)	0.03 (*)	-	-	0.46 (3)	1.06 (7)	0.10 (1)	-	0.10 (1)	11.57 (76)	1.67 (11)
	TOTAL	0.14 (1)	0.02 (*)	0.03 (*)	-	0.60 (4)	0.88 (6)	0.17 (1)	-	0.10 (1)	11.64 (79)	1.47 (10)

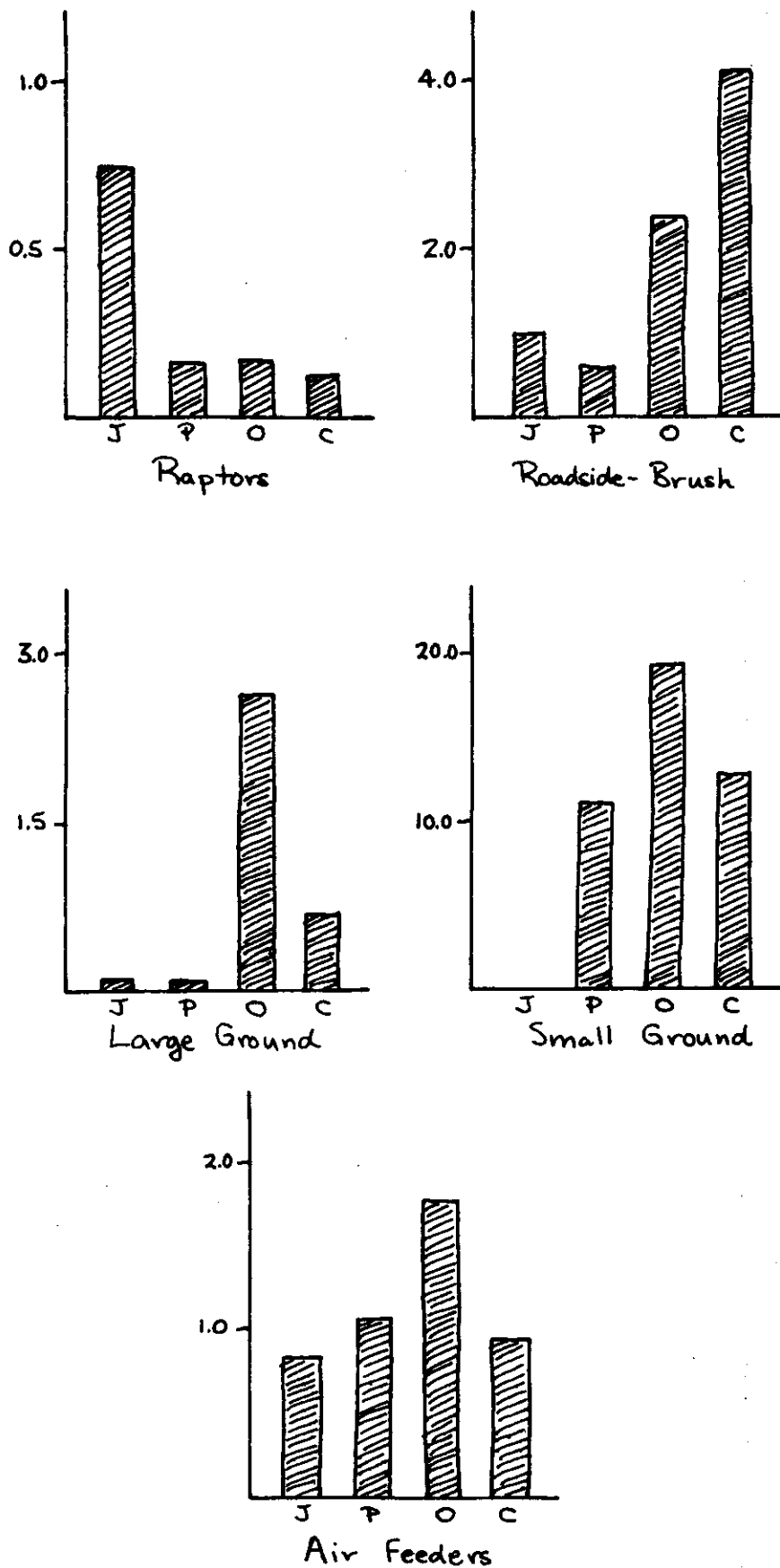


Fig. 4. Incidence of ecological categories of birds (see Table 11) in the roadside counts. Mean density (birds/census stop) on the ordinate; plots as in Fig. 3.

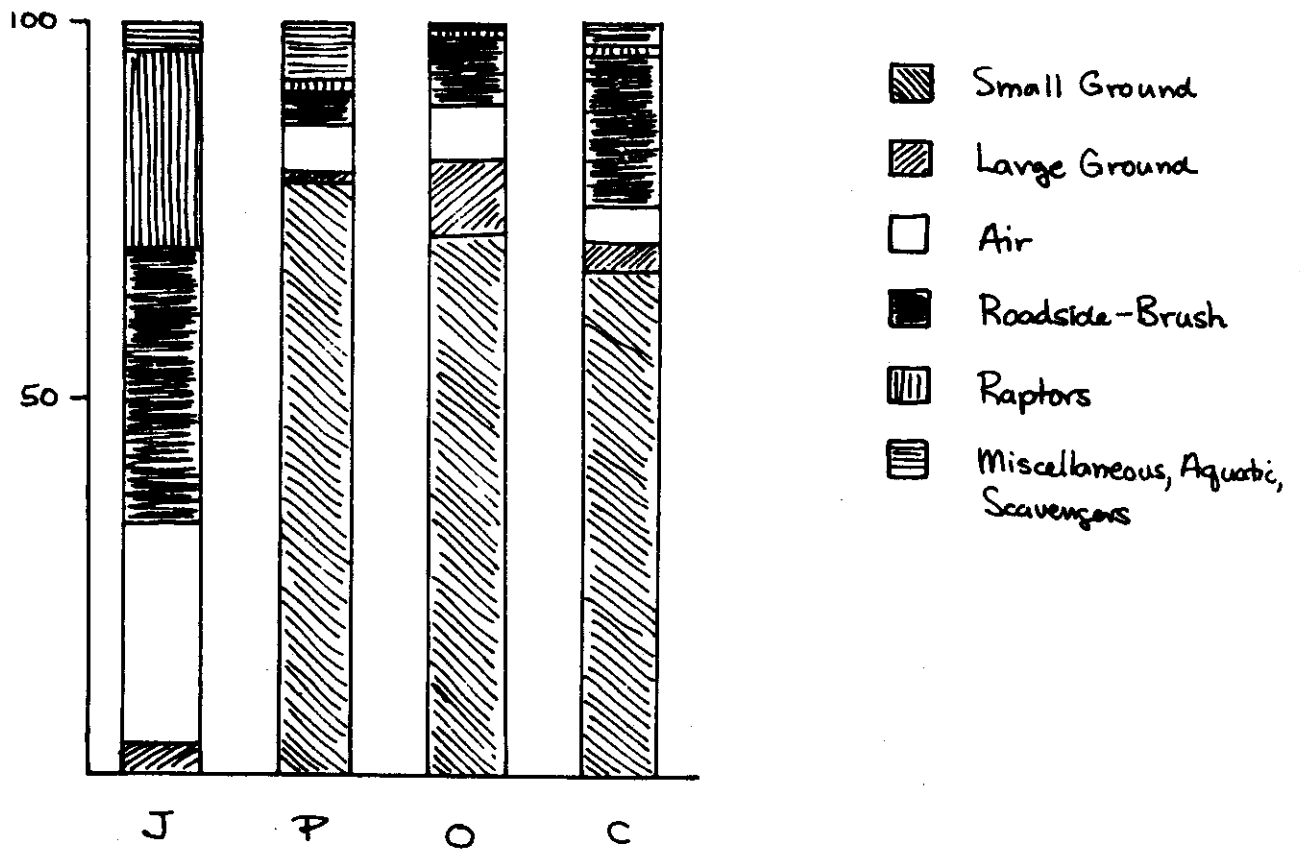


Fig. 5. Ecological composition of the total roadside counts at the Jornada, Pantex, Osage, and Cottonwood sites. Ordinate = percent of total count (see Tables 6 through 9) consisting of the indicated ecological category.

Table 13. Comparison of plot census and roadside count results. Values are percentages of total census or count represented by each species recorded. Only species recorded in both plot and roadside censuses are considered. Total roadside count results were used in this analysis.

Site	Species	Plot Census	Road Count ^{a/}	Total Road ^{b/} Count
<i>Grazed Treatments</i>				
Jornada	Mockingbird	24	56	31
	Loggerhead Shrike	67	37	21
	Scaled Quail	9	7	4
Pantex	Horned Lark	74	31	16
	Western Meadowlark	19	68	36
	Grasshopper Sparrow	6	1	1
	Lark Bunting	1	0	0
Osage	Eastern Meadowlark	35	36	28
	Dickcissel	32	33	27
	Grasshopper Sparrow	29	20	16
	Upland Plover	4	11	9
Cottonwood	Horned Lark	86	24	14
	Western Meadowlark	12	63	37
	Grasshopper Sparrow	2	13	8
<i>Ungrazed Treatments</i>				
Jornada	Ash-throated Flycatcher	40	25	16
	Mockingbird	35	50	31
	Western Kingbird	20	24	15
	Cactus Wren	5	1	1
Pantex	Horned Lark	57	31	16
	Western Meadowlark	33	68	36
	Grasshopper Sparrow	9	1	1
	Lark Bunting	1	0	0
Cottonwood	Grasshopper Sparrow	50	12	8
	Western Meadowlark	24	56	37
	Horned Lark	16	22	14
	Long-billed Curlew	5	3	2
	Upland Plover	5	2	1
	Chestnut-collared Longspur	1	6	4

^{a/} Percent of count for only those species listed.

^{b/} Percent of total roadside count, including all species.

generally lower roadside values for relatively inconspicuous species such as Horned Larks and Grasshopper Sparrows, and the higher roadside value for the conspicuous meadowlarks. Third, the roadside counts provide an indication of how representative the study sites are of grassland conditions in the local area. At Pantex, for example, Cassin's Sparrow was the second most abundant species on the roadside counts, but was entirely absent from both plots. This species is closely associated with low brush (e.g., sagebrush) or forb clumps, a vegetational feature which is common in west Texas rangelands but which was conspicuously absent from the study plots.

Plot Censuses

Migratory characteristics. MacArthur (1959) called attention to the ecological correlates of migratory habits among North American birds, and suggested that in areas characterized by relatively little seasonal change in food supply (he included prairies in this category) the proportion of breeding individuals which are "neotropical migrants" should be small. Using a somewhat different categorization (Table 14), in which my "migratory" is roughly equivalent to MacArthur's "neotropical migrant," I have considered the composition of the plot censuses with regard to migratory tendencies (Table 15). The pattern, if any, is sketchy. Southern latitude areas (Pantex, Jornada) are characterized by relatively high proportions of resident species, but so is Cottonwood (although here the high residency proportion is of individuals but not so much species or biomass). Bison and Bridger lack resident species, but here most species and individuals undertake short movements (mainly altitudinal shifts) rather than true migrations.

Table 14. Migratory status of the species considered in this study.

Species	Migratory Status ^{a/}
Upland Plover	Mig.
Long-billed Curlew	Mig.
Mountain Plover	Mig.
Scaled Quail	Res.
Nighthawk	Mig.
Ash-throated Flycatcher	Mig.
Western Kingbird	Mig.
Horned Lark	Res. (except Bridger, SM)
Cactus Wren	Res.
Robin	SM
Mountain Bluebird	SM
Mockingbird	Mig.
Loggerhead Shrike	Res.
Eastern Meadowlark	Res.
Western Meadowlark	Res. (Pantex, Pawnee) SM (Cottonwood Bison)
Dickcissel	Mig.
Lark Bunting	Mig.
Grasshopper Sparrow	SM
Vesper Sparrow	Mig.
Brewer's Sparrow	Mig.
McCowan's Longspur	SM
Chestnut-collared Longspur	SM

^{a/} Mig. = migratory (U.S. - Mexico border and south); SM = short movement (up to several hundred miles); Res = resident (species present in area entire year).

Table 15. Migratory patterns of birds breeding on grassland study plots. The migratory status for each species is given in Table 14.

Site	Treatment	Per cent Species			Per cent individuals			Per cent Biomass		
		Migratory	Short Movement	Resident	Migratory	Short Movement	Resident	Migratory	Short Movement	Resident
Jornada	Grazed	0	0	100	0	0	100	0	0	100
	Ungrazed	50	0	50	60	0	40	73	0	27
Pantex	Grazed	25	25	50	1	6	93	1	2	97
	Ungrazed	25	25	50	1	9	90	1	3	96
Osage	Grazed	50	25	25	36	29	35	26	9	65
Pawnee	Heavy Summer	50	17	33	18	28	54	24	20	56
	Heavy Winter	67	0	33	59	0	41	58	0	42
Cottonwood	Grazed	0	67	33	0	14	86	0	31	69
	Ungrazed	33	50	17	10	16	74	49	7	44
Bridger	Grazed	25	75	0	49	51	0	32	68	0
Bison	Grazed	33	67	0	5	95	0	2	98	0

Site comparisons. Realistic comparisons of the network site breeding bird populations cannot be undertaken until information is available from other studies to provide some measure of site similarity (on the basis of climate, growing season, primary production, insect standing crop, etc.). Still, differences are startlingly apparent in both the roadside count and plot census results. The Jornada Site supports only sparse populations and low biomass, while Osage, Pantex, and Pawnee, and especially the ungrazed plot at Cottonwood, support relatively high densities and biomass (Table 12). These trends show no direct relation to annual above-ground primary production or yearly precipitation.

Treatment comparisons. One of the objectives of the IBP Grassland Biome study is to monitor the effects of large herbivore grazing on ecosystem structure and function. It has already been shown that grazing has effects on the species composition, density, and standing crop biomass of breeding avifaunas at Pawnee (Wiens 1970, Giezantanner and Ryder 1969). Differences are also apparent at the Comprehensive Network sites (Table 2 and 16). At Pantex, for example the standing crop biomass in the two treatments was quite similar, but density (birds/100 ha) was greater in the grazed treatment, while species diversity was greater in the ungrazed plot. These differences can be attributed to variations in the abundance of Horned Larks and Western Meadowlarks (Table 2), since the species composition of the two plots was identical. At Cottonwood, on the other hand, avian density was twice as high on the ungrazed as on the grazed plot, biomass three times greater. Here six species occurred on the ungrazed treatment compared with three on the grazed plot; Horned Larks were more abundant on the grazed plot (131 vs. 49 birds/100 ha), but Western Meadowlarks (73 vs. 18) and Grasshopper Sparrows (154 vs.

Table 16. Partitioning of biomass by size classes for the study plots. For each stand, the per cent of all individuals and per cent of total biomass in each of three size categories is given. Small = <25 g/individual; medium = 25-80 g/individual; large = >80 g/individual.

Site	Treatment	Per Cent Individuals			Per Cent Biomass		
		Small	Medium	Large	Small	Medium	Large
Jornada	Grazed	10	90	0	30	70	0
	Ungrazed	0	100	0	0	100	0
Pantex	Grazed	6	75	19	3	55	42
	Ungrazed	9	58	33	3	35	62
Osage	Grazed	29	32	39	9	17	74
Pawnee	Heavy Summer	0	92	8	0	79	21
	Heavy Winter	9	91	0	3	97	0
Cottonwood	Grazed	2	86	12	1	30	69
	Ungrazed	51	16	33	12	7	81
Bridger	Grazed	49	51	0	32	68	0
Bison	Grazed	56	0	44	19	0	81

4) were much more common on the ungrazed treatment. A great deal of the difference in biomass was accounted for by the occurrence of Longbilled Curlews on the ungrazed plot.

Comparisons between grazing treatments among plots in the Comprehensive Network are severely hampered, however, by the lack of any clear, *quantitative* definition of the difference between "grazed" and "ungrazed" range conditions. Before meaningful comparisons can be drawn, with birds or with any organisms, *there must be established some measure of the "ecological distance" between treatment types at each of the sites.*

Biomass partitioning. I have suggested elsewhere (Wiens 1970) that the pattern of allocation of biomass among different-sized individuals may represent a basic strategy of ecosystem response by birds. The partitioning of biomass and individuals among three size classes at the plots is given in Table 16. Some plots (Bison, Osage, Cottonwood, Pantex) are dominated by large species, while medium-sized species are well represented only at Bridger, Bison, and Cottonwood (ungrazed). Note that Bridger and Cottonwood grazed, for example, have quite similar densities and standing crops, but differ in the pattern of distribution of biomass among individuals.

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APPENDIX I

FIELD DATA

Avian Road Count Summary

Avian road count summary data collected in 1970 are maintained as separate Grassland Biome data sets by site, as follows:

Site	Data Set
Cottonwood	A2U2004
Jornada	A2U2008
Osage	A2U2009
Pantex	A2U200A

Data were collected on Form NREL-22. A sample data form and the data follow.

+++ FIELD DATA +++

	1	2	3	4	5	6	7	8
	12345678901	23456789012	34567890123	45678901234	56789012345	67890123456	78901234567	8901234567890
2204JAW260670		5 ER AL	37 20 21		20 30			
		8 ST NE	67 66 70		30 30			
		8 AG PH	35 40 42		23 30			
		9 AM SA	7 17 16		16 30			
		0 AN PL	5 0 0		2 30			
		9 CA OR	7 12 2		9 30			
		3 NU AM	4 5 0		5 30			
		3 BA LO	2 2 0		3 30			
		6 TU MI	4 0 0		2 30			
		1 FA SP	1 0 0		1 30			
		9 CA ME	4 23 6		12 30			
		8 QU QU	1 0 0		1 30			
		5 TY VE	5 2 6		8 30			
		4 ZE MA	8 2 7		9 30			
		6 TO RU	2 0 1		3 30			
		5 HI RU	1 0 9		6 30			
		2 PH CO	1 0 1		2 30			
		1 RU JA	0 1 0		1 30			
		8 MO AT	0 2 1		2 30			
		3 CH VO	0 3 0		2 30			
		5 PE PY	0 0 3		2 30			
		9 CH GR	0 0 2		1 30			
		5 TY TY	0 0 1		1 30			
2204JAW270670		8 ST NE	79 63 82		30 30			
		5 ER AL	42 26 21		25 30			
		8 AG PH	25 32 31		21 30			
		5 TY VE	5 0 3		7 30			
		9 AM SA	18 20 11		16 30			
		3 BA LO	2 4 7		8 30			
		3 NU AM	1 8 2		5 30			
		9 CA OR	5 13 8		13 30			
		3 CH VO	4 3 6		5 30			
		5 PE PY	2 0 5		3 30			
		8 QU QU	3 3 0		3 30			
		9 CA ME	1 17 0		5 30			
		0 AN PL	2 0 0		1 30			
		5 TY TY	1 2 2		4 30			
		4 ZE MA	5 3 5		9 30			
		6 TO RU	1 0 0		1 30			
		7 ST VU	1 0 0		1 30			
		1 BU JA	0 2 1		3 30			
		1 BU SW	0 1 0		1 30			
		8 MO AT	0 3 0		1 30			
		2 PH CO	0 1 0		1 30			
		1 FA SP	0 1 0		1 30			
		5 HI RU	0 0 10		3 30			
		9 CH GR	0 0 2		2 30			

2208JAW300570

1	CA	AU	0	00	00	01	01	30
1	BU	SW		00	00	02	01	30
1	AQ	CH		01	01	00	02	30
2	CA	SQ		03	00	00	03	30
4	ZE	MA		01	01	02	04	30
4	AS	FL		01	00	00	01	30
5	TY	VE		08	02	03	07	30
5	MY	CI		02	05	04	08	30
5	CO	CO		01	00	00	01	30
5	CA	BR		00	01	00	01	30
6	MI	PO		10	08	07	17	30
6	TO	CU		00	01	00	01	30
7	LA	LU		01	04	07	09	30
8	IC	PA		03	00	00	03	30

2208JAW310570

1	BU	SW		02	00	00	02	30
1	AQ	CH		00	01	01	02	30
2	CA	SQ		03	00	00	02	30
5	TY	VE		08	02	01	10	30
5	MY	CI		05	05	04	11	30
5	CA	BR		01	00	00	01	30
6	MI	PO		08	12	06	15	30
7	LA	LU		04	10	08	16	30
8	IC	PA		01	00	00	01	30

2209JAW130670

3	RA	LO		15	25	38	23	30
8	ST	MA		67	83	92	30	30
8	ST	NE		01	00	00	01	30
9	SP	AM		68	71	73	30	30
9	AM	SA		53	42	42	30	30
5	HI	RU		08	10	08	10	30
8	AG	PH		09	22	24	20	30
8	QU	QU		02	05	01	05	30
3	CH	VO		02	00	04	03	30
4	ZE	MA		02	07	06	07	30
5	ER	AL		12	00	00	06	30
8	MO	AT		03	00	00	01	30
5	PE	PY		11	00	00	02	30
2	BU	VI		00	01	00	01	30
4	CH	MI		00	01	06	04	30
1	CI	CY		00	01	02	03	30
5	ST	RU		00	03	00	01	30
5	TY	TY		00	05	02	05	30
5	MU	FO		00	02	02	04	30
8	IC	SP		00	02	00	01	30
5	TY	VE		00	01	00	01	30
6	MI	PO		00	01	01	02	30
2	CO	VI		00	01	06	06	30
2	AR	HE		00	00	01	01	30
7	LA	LI		00	00	01	01	30

2209JAW140670

3	BA	LO	23	27	18	24	30
8	ST	MA	51	80	91	30	30
8	ST	NE	03	01	00	03	30
5	HI	RU	10	00	13	06	30
9	SP	AM	80	69	75	30	30
8	AG	PH	05	10	16	10	30
5	TY	TY	02	06	01	06	30
8	QU	QU	04	14	08	09	30
2	AR	HE	02	00	01	03	30
3	CH	VO	02	01	03	04	30
9	AM	SA	56	36	30	28	30
4	ZE	MA	02	02	07	06	30
2	TY	CU	03	00	00	01	30
5	ER	AL	03	00	02	04	30
2	CO	VI	04	00	00	01	30
5	PE	PY	07	01	00	02	30
1	CI	CY	01	00	02	03	30
6	MI	PO	00	04	00	04	30
5	MU	FO	00	04	02	03	30
4	CH	MI	00	01	00	01	30
7	LA	LU	00	01	02	02	30
5	CO	BR	00	00	01	01	30
1	CA	AU	00	00	01	01	30

2210JAW050670

1	CI	CY	01	00	00	01	30
5	ER	AL	48	15	01	14	30
8	ST	NE	49	63	53	30	30
4	ZE	MA	13	19	07	15	30
9	AL	CA	36	55	27	25	30
8	AG	PH	01	00	00	01	30
9	AM	SA	03	00	00	02	30
6	MI	PO	01	01	14	07	30
5	TY	VE	04	00	03	06	30
1	FA	SP	01	00	01	02	30
5	HI	RU	01	15	02	05	30
9	PO	GR	01	00	02	02	30
2	CA	SO	01	00	01	02	30
8	MO	AT	00	02	00	01	30
3	CH	MI	00	01	02	02	30
1	CA	AU	00	00	02	01	30
4	CA	VO	00	00	04	02	30
2	CO	VI	00	00	01	01	30
1	RU	SW	00	00	01	01	30

2210JAW060670

8	ST	NE	68	44	42	30	30
5	ER	AL	58	17	05	17	30
4	ZE	MA	21	14	15	20	30
9	AL	CA	37	54	16	23	30
8	MO	AT	01	00	03	02	30
1	BU	JA	01	00	00	01	30
4	CH	MI	03	04	00	04	30
5	HI	RU	02	20	03	06	30
6	MI	PO	01	00	06	06	30
9	PO	GR	01	02	01	04	30
9	AM	SA	02	00	00	02	30
3	CH	VO	00	01	02	02	30
5	MU	FO	00	00	03	02	30
7	LA	LU	00	00	01	01	30
1	FA	SP	00	00	01	01	30
2	CA	SO	00	00	02	02	30
2	CO	VI	00	00	01	01	30
1	RU	SW	00	00	02	01	30

Avian Collection--Internal

Avian collection--internal data collected in 1970 are maintained as separate Grassland Biome data sets by sites, as follows:

Site	Data Set
Cottonwood	A2U2014
Jornada	A2U2018
Osage	A2U2019
Pantex	A2U201A

Data were collected on Form NREL-23. A sample data form and the data follow.

FIELD DATA SHEET • AVIAN COLLECTION • INTERNAL

[illegible]

	1	2	3	4	5	6	7	8
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2304.JAW1506702	9AMSA	0093	2300SDJACK01S19E21	013	2105.303.201.2114			1110
	3NUAM	0090	1900SDJACK01S19E21	011	1507.401.9	.	3	2211
	5ERAL	0076	1710SDJACK01S19E21	011	2205.105.501.0164			1110
	5ERAL	0077	1715SDJACK01S19E21	011	1507.904.4	.	4	1110
	5ERAL	0078	1725SDJACK01S19E21	011	2205.702.701.2224			1110
	5ERAL	0079	1725SDJACK01S19E21	011	1506.903.4	.	4	1110
	5ERAL	0080	1725SDJACK01S19E21	011	1510.305.3	.	4	1110
	5ERAL	0081	1735SDJACK01S19E21	011	1508.804.3	.	4	1110
	5ERAL	0082	1735SDJACK01S19E21	011	2206.402.001.1134			1110
	5ERAL	0083	1735SDJACK01S19E21	011	1507.904.1	.	4	1110
	8STNE	0084	1750SDJACK01S19E21	011	2209.704.401.2164			1110
	5ERAL	0085	1805SDJACK01S19E21	011	2206.502.801.2174			1110
	5ERAL	0086	1810SDJACK01S19E21	011	1510.005.5	.	4	1110
	5ERAL	0087	1820SDJACK01S19E21	011	1508.806.6	.	4	1110
	5ERAL	0088	1820SDJACK01S19E21	011	2207.604.401.2244			1110
	5ERAL	0091	1820SDJACK01S19E21	011	1508.205.1	.	4	1110
	5ERAL	0092	1820SDJACK01S19E21	011	2207.304.405.6274			1110
2304.JAW2506704	3NUAM	0089	1900SDJACK01S19E21	011	2514.005.600.8124			2211
2 14.JAW2606703	5ERAL	0094	1715SDJACK01S19E21	011	2306.104.501.8254			1120
	5ERAL	0095	1715SDJACK01S19E21	011	1509.304.1	.	4	1110
	9AMSA	0096	1740SDJACK01S19E21	011	1509.904.5	.	4	1110
	8STNE	0097	1730SDJACK01S19E21	011	1509.906.5	.	4	1110
	9CAOR	0098	1750SDJACK01S19E21	011	1506.604.1	.	4	1110
	5ERAL	0099	1805SDJACK01S19E21	011	2306.902.901.8234			1110
	5ERAL	0100	1805SDJACK01S19E21	011	1508.104.9	.	4	1110
	8STNE	0101	1815SDJACK01S19E21	011	1512.205.0	.	4	1110
	9CAOR	0103	1825SDJACK01S19E21	011	2207.204.000.6104			1110
	9CAOR	0102	1820SDJACK01S19E21	011	1506.604.5	.	4	1111
2304.JAW2706703	8STNE	0104	1950SDJACK01S19E21	011	1510.504.7	.	4	1110
	9CAOR	0105	2000SDJACK01S19E21	011	2305.801.891.8164			1110
	8STNE	0106	2030SDJACK01S19E21	011	2309.204.901.4194			1110
	8STNE	0107	2035SDJACK01S19E21	011	1514.605.7	.	4	1110
2304.JAW280670	5ERAL	0108	1000SDJACK01S19E21	011	1508.706.2	.	4	1110
	5ERAL	0109	1010SDJACK01S19E21	011	2309.003.602.0294			1110
	5ERAL	0110	1010SDJACK01S19E21	011	25	.	2	1110
	5ERAL	0111	1020SDJACK01S19E21	011	1508.705.7	.	4	1110
	5ERAL	0112	1020SDJACK01S19E21	011	1508.505.9	.	4	1110
	5ERAL	0113	1035SDJACK01S19E21	011	1509.705.9	.	4	1110
	8STNE	0114						

27 9JAW310570	5TYVF 0002	1945NMDONA20S01E14	41	1515.306.4	4	222
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	7LALU 0003	2040NMDONA20S01E14	41	2 02.301.4	1	1111
2308JAW010670	5MYCI 0004	1105NMDONA20K01E14	041	1512.204.8	4	1110
	5TYVF 0007	1135NMDONA20K01E14	041	1514.405.2	4	1111
	5MYCI 0005	1115NMDONA20S01E14	041	1512.505.2	4	1111
	7LALU 0008	1150NMDONA20S01E14	041	1504.402.5	1	1110
	5CABR 0006	1130NMDONA20S01E14	041	1507.203.8	4	1111
	8ICPA 0009	1915NMDONA20K01E01	041	1507.003.9	4	2211
2309JAW120670	9AMSA 0048	1905OKOSAG29N	8F33 021	1508.804.2	4	1110
	9SPAM 0049	1915OKOSAG29N	8E33 021	1508.205.7	4	1110
	9SPAM 0050	1920OKOSAG29N	8E33 021	2207.605.301.3144		1120
	9SPAM 0051	1930OKOSAG29N	8E33 021	1507.604.6	4	1110
	9SPAM 0052	2000OKOSAG29N	8E33 021	2107.504.202.0244		1110
	9SPAM 0053	2015OKOSAG29N	8E33 021	1508.404.8	4	1110
2309JAW130670	3BALO 0054	1045OKOSAG29N	8E33 021	1210.405.0	4	2220
	3BALO 0055	1045OKOSAG29N	8E33 021	1504.801.5	3	1110
	8STMA 0056	1715OKOSAG29N	8E33 021	2210.605.401.7254		1110
	8STMA 0057	1725OKOSAG29N	8E33 021	1515.805.9	4	1110
	9SPAM 0058	1735OKOSAG29N	8E33 021	1508.204.4	4	1110
	8STMA 0059	1745OKOSAG29N	8E33 021	1508.205.5	4	1110
	9AMSA 0060	1840OKOSAG29N	8E33 021	2204.804.401.2184		1110
	9AMSA 0061	1840OKOSAG29N	8E33 021	05	4	1110
	3BALO 0062	1900OKOSAG29N	8E33 021	1506.103.5	3	1110
	9SPAM 0063	1925OKOSAG29N	8E33 021	1508.504.9	4	1110
	8STMA 0064	1925OKOSAG29N	8E33 021	2210.205.601.8424		1110
2 JAW140670	9SPAM 0065	1035OKOSAG29N	8E33 021	1509.204.8	4	1110
	8STMA 0066	1040OKOSAG29N	8E33 021	1510.606.5	4	1110
	8STMA 0067	1045OKOSAG29N	8E33 021	1513.506.5	4	1110
	9AMSA 0068	1100OKOSAG29N	8F33 021	1508.705.0	4	1110
	9SPAM 0069	1105OKOSAG29N	8F33 021	1508.205.6	4	1110
	8STMA 0070	1120OKOSAG29N	8E33 021	1512.605.7	4	1110
	8STMA 0071	1135OKOSAG29N	8E33 021	1515.705.1	4	1111
	8STMA 0072	1705OKOSAG29N	8E33 021	1513.106.4	4	1110
	8STMA 0073	1730OKOSAG29N	8E33 021	2214.110.811.5494		1120
	9SPAM 0074	1740OKOSAG29N	8E33 021	1508.404.7	4	1110
	9SPAM 0075	1750OKOSAG29N	8E33 021	1508.305.4	4	1110
2310JAW030670	8STNE 0010	1830TECARS	011 21	11.2634		2110
	8STNE 0011	1840TECARS	011	1510.105.1	4	1111
	8STNE 0012	1849TECARS	011 01121	10.7624		2120
	8STNE 0013	1915TECARS	011 21	11.7984		2121
	8STNE 0014	1930TECARS	011 21	07.1654		2120
	8STNE 0015	1950TECARS	011	1518.306.5	4	1111
2310JAW040670	SERAL 0016	1640TECARS	011	1509.205.6	4	1111
	SERAL 0017	1645TECARS	011	2209.406.203.7374		2230
	SERAL 0018	1700TECARS	011	1511.106.6	4	1110
	SERAL 0019	1700TECARS	011	1510.606.1	4	1110
	SERAL 0020	1710TECARS	011	2206.803.401.9344		2220
	SERAL 0021	1720TECARS	011	1508.505.1	4	1110
	SERAL 0022	1720TECARS	011	1509.105.9	4	1110
	SERAL 0023	1730TECARS	011	1509.505.7	4	1110
	SERAL 0024	1745TECARS	011	1511.305.4	4	1110
	SERAL 0025	1745TECARS	011	2205.402.402.2434		2230

2 .0JAW050670

SERAL 0026 1825TECARS
SERAL 0027 1825TECARS
SERAL 0028 1840TECARS
SERAL 0029 1840TECARS
SERAL 0030 1900TECARS
SERAL 0031 1910TECARS
SERAL 0032 1915TECARS
SERAL 0033 1920TECARS
SERAL 0034 1920TECARS

011 1509.705.8 4 1110
011 1511.205.8 4 1110
011 1509.805.6 4 1110
011 2212.405.705.6444 1120
011 2208.405.901.5274 1110
011 1507.506.8 4 1110
011 1507.504.9 4 1110
011 2106.103.701.0194 1110
011 1507.905.4 4 1110

2310.JAW060670

8STNE 0035 2000TECARS
8STNE 0036 2005TECARS
8STNE 0037 2015TECARS
8STNE 0038 2020TECARS
8STNE 0039 2025TECARS
8STNE 0040 2030TECARS

011 2209.006.100.7274 1110
011 2209.510.604.5944 1120
011 2207.305.101.4504 1110
011 2209.704.801.4184 1110
011 2210.006.102.3314 1120
011 2210.906.007.8344 1110

2310.JAW070670

SERAL 0041 1055TECARS
SERAL 0042 1055TECARS
SERAL 0043 1105TECARS
SERAL 0044 1110TECARS
SERAL 0045 1125TECARS
SERAL 0046 1125TECARS
8STNE 0047 1140TECARS

011 1509.704.8 4 1110
011 1509.205.5 4 1110
011 2206.405.301.8304 1120
011 2207.104.701.3264 1120
011 2206.704.001.7284 1120
011 1508.104.6 4 1110
011 1502.302.0 1 1110

Avian Collected--External

Avian collection--external data collected in 1970 are maintained as separate data sets by site, as follows:

Site	Data Set
Cottonwood	A2U2024
Jornada	A2U2028
Osage	A2U2029
Pantex	A2U202A

Data were collected on Form NREL-24. A sample data form and the data follow.

IBP



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FIELD DATA SHEET - AVIAN COLLECTION - EXTERNAL

DATA TYPE	SITE	INITIALS	DATE		TREATMENT	REPLICATE	PLOT SIZE	GROUP	GENUS	SPECIES	SUBSPECIES	SPECIMEN NUMBER	SEX	DEVELOPMENT	AGE	AGE UNITS	WEIGHT	WING LENGTH	BILL			TAIL LENGTH	TARSUS	MIDDLE TOE	
			Day	Mo															Yr	Length	Height				Width
1-2	3-4	5-7	8-9	10-11	12-13	14	15	16-19	21	22-23	24-25	26	28-31	32	34	35-36	37	39-43	45-49	51-55	57-60	61-64	65-68	70-74	76-79
DATA TYPE 01 Aboveground Biomass 02 Litter 03 Belowground Biomass 10 Vertebrate - Live Trapping 11 Vertebrate - Snap Trapping 12 Vertebrate - Collection 20 Avian Flush Census 21 Avian Road Count 22 Avian Road Count Summary 23 Avian Collection - Internal 24 Avian Collection - External 25 Avian Collection - Plumage 30 Invertebrate 40 Microbiology - Decomposition 41 Microbiology - Nitrogen 42 Microbiology - Biomass 43 Microbiology - Root Decomposition 44 Microbiology - Respiration SEX 0 Unknown 1 Male 2 Female DEVELOPMENT 0 Not noted 1 Nestling 2 Juv. or imm. 3 Subadult 4 Adult AGE UNITS 0 No observation 1 Hour 2 Days 3 Weeks 4 Months 5 3 months 6 Years SITE 01 Ale 02 Bison 03 Bridger 04 Cottonwood 05 Dickinson 06 Hays 07 Hopland 08 Jornada 09 Osage 10 Pantex 11 Pawnee GROUP 0 Waterfowl 1 Falconiform 2 Galli- and Gruiform 3 Charadriiform 4 Devo, owls, nighthawks, woodpeckers 5 Flycatchers, swallows, jays, titmice, wrens 6 Thrashers, bluebirds, gnatcatchers, pipits 7 Shrikes, starlings, vireos 8 Icterids 9 Fringillids TREATMENT 1 Ungrazed 2 Lightly grazed 3 Moderately grazed 4 Heavily grazed 5 Grazed 1969, ungrazed 1970 6 7 8 9																									

+++ FIFLD DATA +++

	1	2	3	4	5	6	7	8
	12345678901	23456789012	34567890123	45678901234	56789012345	67890123456	78901234567	8901234567890
2404JAW1506702	9AMSA	00932	4	0	018.6	060.7	043.4	06.603.704.3 018.9
	3NUAM	00901	2	0	461.7	249.5	092.4	97.207.907.9 072.4
	SERAL	00762	4	0	032.1	096.1	069.3	08.703.603.8 019.6
	SERAL	00771	4	0	033.5	101.3	068.3	08.703.503.6 020.4
	SERAL	00782	4	0	032.4	092.7	059.4	08.803.203.5 020.3
	SERAL	00791	4	0	032.8	104.5	073.4	10.004.203.5 022.4
	SERAL	00801	4	0	033.2	108.1	067.8	09.603.703.4 021.2
	SERAL	00811	4	0	030.9	101.2	068.8	10.103.403.0 020.0
	SERAL	00822	4	0	033.5	096.8	063.8	08.603.503.1 019.4
	SERAL	00831	4	0	032.6	104.2	072.1	09.803.703.7 021.9
	8STNE	00842	4	0	084.7	109.2	058.3	20.407.805.6 035.1
	SERAL	00852	4	0	032.9	095.3	058.6	09.203.503.5 019.6
	SERAL	00861	4	0	029.9	102.0	068.0	09.403.503.7 021.4
	SERAL	00871	4	0	030.7	103.3	066.2	09.803.303.5 020.0
	SERAL	00882	4	0	029.0	095.4	066.0	07.903.303.3 019.6
	SERAL	00911	4	0	032.8	106.5	069.4	09.603.603.5 021.4
	SERAL	00922	4	0	031.6	090.8	059.4	07.803.803.7 020.5
2404JAW2506704	3NUAM	00892	4	0	591.5	271.5	098.0149.4	09.509.1 079.0
2404JAW2606703	SERAL	00942	4	0	030.9	092.7	060.2	08.203.603.6 019.2
	SERAL	00951	4	0	034.6	105.9	069.6	09.503.403.5 021.9
	9AMSA	00961	4	0	018.1	060.4	041.7	06.704.804.3 018.9
	8STNE	00971	4	0	118.0	121.5	074.0	22.807.906.6 037.1
	9CAOR	00981	4	0	018.8	075.7	056.3	07.204.504.6 018.7
	SERAL	00992	4	0	029.5	091.7	067.2	08.603.503.5 019.7
	SERAL	01001	4	0	031.6	105.3	072.9	09.903.503.5 019.7
	8STNE	01011	4	0	103.8	119.4	068.2	20.807.306.5 035.2
	9CAOR	01032	4	0	017.3	075.5	049.9	06.803.403.8 017.8
	9CAOR	01021	4	0	019.9	080.7	054.2	07.203.804.3 018.8
2404JAW2706703	8STNE	01041	4	0	118.6	118.6	070.8	22.007.806.7 037.4
	9CAOR	01052	4	0	018.4	075.7	052.3	07.304.304.9 018.2
	8STNE	01062	4	0	084.2	111.1	062.3	21.907.407.2 036.2
	8STNE	01071	4	0	107.9	125.4	079.1	22.508.307.3 037.1
2404JAW280670	SERAL	01081	4	0	030.3	102.9	068.4	11.404.604.7 021.9
	SERAL	01092	4	0	029.7	095.4	063.9	09.504.404.6 021.0
	SERAL	01102	2014	0	027.7	088.7	049.7	08.004.004.4 020.1
	SERAL	01111	4	0	031.1	103.1	071.2	10.704.204.5 022.6
	SERAL	01121	4	0	033.9	101.5	067.4	10.604.404.6 023.1
	SERAL	01131	4	0	035.0	099.1	069.9	10.6 . 04.8 021.6
	8STNE	01141	4	0	117.1	125.7	070.5	22.708.807.6 037.8
	8STNE	01152	4	0	101.0	108.6	068.7	20.307.706.3 034.7
	9AMSA	01161	4	0	017.3	061.6	043.2	07.405.904.9 020.3
	9AMSA	01171	4	0	017.4	064.7	046.4	08.005.805.3 019.9
	9AMSA	01182	4	0	017.8	056.9	.	08.1 . 05.1 020.4
	9AMSA	01191	4	0	015.8	061.0	044.0	07.905.705.3 019.8
	8STNE	01201	4	0	104.6	122.4	070.2	22.407.707.0 036.4
	9AMSA	01211	4	0	015.0	066.6	048.5	08.105.505.2 019.3
	8STNE	01221	4	0	112.0	123.0	072.6	22.708.007.2 037.8
	8STNE	01232	4	0	089.7	109.6	065.2	21.507.305.7 036.1

2408 JAW310570	STYVF	00021	4	0	037.4	128.4	091.2	12.906.207.0	019.4
	5MYCI	00011	4	0	028.1	099.4	089.5	13.505.206.5	023.1
	7LALI	00032	2015		044.3	093.8	095.7	10.707.504.1	027.0
2408 JAW010670	5MYCI	00041	4	0	027.1	100.7	094.3	14.905.706.6	022.4
	STYVF	00071	4	0	038.8	133.2	090.3	13.206.007.7	017.9
	5MYCI	00051	4	0	027.7	098.4	092.8	14.805.606.5	022.4
	7LALI	00081	2015		045.6	090.9	070.5	09.207.206.0	026.1
	5CABR	00061	4	0	038.7	090.3	083.6	18.505.103.5	027.5
	8ICPA	00091	4	0	036.7	099.0	081.8	15.605.404.7	023.4
2409 JAW120670	9AMSA	00481	4	0	017.2	061.7	044.7	06.905.804.8	018.4
	9SPAM	00491	4	0	029.9	080.4			
	9SPAM	00502	4	0	025.0	072.5	050.4	09.006.905.4	020.4
	9SPAM	00511	4	0	027.6	078.4	059.5	09.307.006.0	022.5
	9SPAM	00522	4	0	026.0	072.0	049.6	09.106.605.4	021.0
	9SPAM	00531	4	0	030.6	082.2	057.9	09.907.806.1	022.4
2409 JAW130670	3BALO	00541	4	0	128.7	170.2	083.8	21.004.004.4	047.6
	3BALO	00551	2	0	120.5	165.1	085.0	19.203.203.6	046.5
	8STMA	00562	4	0	082.2	105.8	061.2	19.707.006.5	036.3
	8STMA	00571	4	0	113.4	124.2	076.7	22.007.306.9	040.4
	9SPAM	00581	4	0	029.0	080.5	055.4	09.507.505.5	021.3
	8STMA	00591	4	0	106.7	117.3	071.5	21.806.907.2	038.6
	9AMSA	00602	4	0	017.0	059.1	042.7	07.204.504.4	018.5
	9AMSA	00610	4	0	016.5	060.9	042.4	07.004.803.9	017.9
	3BALO	00621	2	0	128.8	170.1	082.7	19.104.304.6	044.9
	9SPAM	00631	4	0	030.7	080.6	058.7	09.706.905.9	021.1
	8STMA	00642	4	0	075.9	103.0	062.0	19.306.205.6	035.8
2409 JAW140670	9SPAM	00651	4	0	030.6	080.0	057.9	09.707.105.6	021.6
	8STMA	00661	4	0	102.6	114.1	072.7	22.907.706.7	037.0
	8STMA	00671	4	0	103.5	114.5	072.6	23.307.507.1	038.5
	9AMSA	00681	4	0	016.2	062.0	044.7	06.905.404.8	019.2
	9SPAM	00691	4	0	031.8	080.1	058.6	09.907.705.5	022.6
	8STMA	00701	4	0	118.4	114.6	072.9	20.006.606.6	037.4
	8STMA	00711	4	0	116.5	119.8	072.3	23.907.607.1	038.7
	8STMA	00721	4	0	117.6	115.4	074.5	23.408.206.1	039.6
	8STMA	00732	4	0	096.7	105.2	061.9	20.806.806.4	034.7
	9SPAM	00741	4	0	026.0	075.9	055.3	08.807.205.1	020.5
	9SPAM	00751	4	0	028.9	083.4	058.8	08.907.405.1	021.6
2410 JAW030670	8STNE	00102	4	0	098.0	113.4	065.7	18.907.505.7	034.3
	8STNE	00111	4	0	107.1	118.2	073.5	21.507.706.7	037.4
	8STNE	00122	4	0	093.7	109.4	064.2	18.806.505.6	034.9
	8STNE	00132	4	0	103.1	111.2	069.7	19.806.805.7	034.8
	8STNE	00142	4	0	098.5	112.5	063.2	20.506.806.3	038.5
	8STNE	00151	4	0	106.4	124.2	074.4	19.708.107.2	039.4
2410 JAW040670	5ERAL	00161	4	0	031.4	103.8	073.0	09.404.104.3	021.9
	5ERAL	00172	4	0	034.4	096.5	064.0	07.903.803.4	019.6
	5ERAL	00181	4	0	031.5	105.1	072.4	09.403.904.6	020.5
	5ERAL	00191	4	0	033.1	107.3	072.2	09.104.203.7	020.3
	5ERAL	00202	4	0	031.1	097.9	062.9	09.003.904.0	020.5
	5ERAL	00211	4	0	032.0	108.8	072.9	09.604.204.3	021.2
	5ERAL	00221	4	0	033.4	106.7	073.4	09.404.403.9	021.5
	5ERAL	00231	4	0	034.1	109.4	073.7	09.704.403.9	021.6
	5ERAL	00241	4	0	033.1	106.7	074.3	09.604.404.4	021.8
	5ERAL	00252	4	0	030.4	096.8	064.6	08.804.304.3	020.3

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SERAL	00261	4	0	034.1	105.9	073.2	10.103.704.3	020.7
SERAL	00271	4	0	033.2	110.8	076.5	09.104.604.3	022.0
SERAL	00281	4	0	032.9	103.6	069.0	10.404.104.4	020.7
SERAL	00292	4	0	035.9	096.6	063.2	08.804.204.0	021.4
SERAL	00302	4	0	032.6	098.7	063.9	09.103.803.7	020.6
SERAL	00311	4	0	032.2	105.2	069.0	09.104.603.8	021.3
SERAL	00321	4	0	031.3	108.5	072.3	09.304.404.4	020.3
SERAL	00332	4	0	028.5	096.0	068.5	08.303.804.3	020.1
SERAL	00341	4	0	031.4	104.8	069.6	09.703.704.1	021.1
8STNF	00352	4	0	077.7	108.5	057.1	20.606.206.0	035.6
8STNF	00362	4	0	098.5	107.3	063.0	18.606.805.9	035.6
8STNF	00372	4	0	077.7	106.5	062.1	20.206.606.4	035.9
8STNF	00382	4	0	081.5	112.3	064.9	20.406.406.2	035.5
8STNE	00392	4	0	083.5	108.9	063.9	19.406.405.6	034.8
8STNE	00402	4	0	091.7	107.3	063.4	20.706.205.8	035.7
SERAL	00411	4	0	031.5	105.3	072.0	10.003.904.1	022.4
SERAL	00421	4	0	033.1	107.0	072.3	09.404.004.1	022.6
SERAL	00432	4	0	032.0	098.3	067.4	09.603.903.7	022.1
SERAL	00442	4	0	031.8	098.4	066.3	09.703.804.4	020.4
SERAL	00452	4	0	031.9	097.1	061.4	09.004.404.4	021.0
SERAL	00461	4	0	028.9	104.7	070.3	09.504.003.8	022.1
SERAL	00471	2024	055.6	096.8	049.4	11.206.005.7	033.8	

2410.JAW060670

2410.JAW070670