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*** START OF THE PROJECT GUTENBERG EBOOK THE BREEDING BIRDS OF KANSAS ***

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The Breeding Birds of Kansas

BY

RICHARD F. JOHNSTON

**UNIVERSITY OF KANSAS
LAWRENCE**

1964

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INTRODUCTION

The breeding avifauna of Kansas has received intermittent attention from zoologists for about 75 years. Summary statements, usually concerning all birds of the state, have been published by Goss (1891), Long (1940), Goodrich (1941), Tordoff (1956) and Johnston (1960). All but the first dealt with the breeding birds chiefly in passing, and none was concerned primarily with habitat distributions and temporal characteristics of Kansan birds. The present work treats mainly certain temporal relationships of breeding birds in Kansas, but also geographic distribution, habitat preferences, and zoogeographic relationships to the extent necessary for a useful discussion of temporal breeding phenomena.

Information on breeding of some of the 176 species of birds known to breed in Kansas is relatively good, on a few is almost non-existent, and on most is variously incomplete. It is nevertheless possible to make meaningful statements about many aspects of the breeding biology and distribution of most species of Kansan birds; we can take stock, as it were, of available information and assess the outstanding avenues of profitable future work. In the accounts of species below, the information given is for the species as it occurs in Kansas, unless it is otherwise stated. For the various subsections analyzing biology and distribution, only information taken in Kansas is used, and for this reason the analyses are made on about half the species breeding in the state. An enormous amount of observational effort has been expended by several dozen people in order that suitable data about breeding birds of Kansas be available; all persons who have contributed in any way are listed in the section on acknowledgments, following the accounts of species. [Pg 578]

Kansas has been described topographically, climatically, and otherwise ecologically many times in the recent past; the reader is referred to the excellent account by Cockrum (1952), which treats these matters from the viewpoint of a zoologist. For present purposes it will suffice to mention the following characteristics of Kansas as a place lived in by birds.

Topographically, Kansas is an inclined plane having an elevation of about 4100 feet in the northwest and about 700 feet in the southeast. West of approximately 97° W longitude, the topography is gently rolling, low hills or flat plain; to the east the Flint Hills extend in a nearly north to south direction, and to the east of these heavily weathered, grassy hills is a lower-lying but more heavily dissected country, hills of which show no great differences in elevation from surrounding flatland.

The vegetation of eastern Kansas comingles with that of the western edge of the North American deciduous forest; a mosaic of true forest, woodland remnants, and tall-grass prairie occupies this area east of the Flint Hills. From these hills west the prairie grassland today has riparian woodland along watercourses; the prairie is composed of proportionally more and more short-grass elements to the west and tall-grass elements to the east.

Climate has a dominating influence on the vegetational elements sketched above. Mean annual rainfall is 20 inches or less in western sectors and increases to about 40 inches in the extreme eastern border areas. Mean monthly temperatures run from 25°F. or 30°F. in winter to 80°F. or 90°F. in summer. The northwestern edges of Caribbean Gulf warm air masses regularly reach northward only to the vicinity of Doniphan County, in northeastern Kansas, and extend southwestward into west-central Oklahoma; these wet frontal systems are usually dissipated along the line indicated by masses of arctic air, sometimes in spectacular fashion. The regular recurrence of warm gulf air is responsible for the characteristically high relative humidity in summer over eastern Kansas and it has an ameliorating effect on winter climate in this region. Almost immediately to the north in Nebraska and to the west in the high plains, summers are dryer and winters are notably more severe. The breeding distributions of some species of birds fairly closely approximate the distribution of these warm air masses; these examples are noted where appropriate below. [Pg 579]

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DISTRIBUTION OF BIRDS IN KANSAS

Birds breeding in Kansas are taxonomically, ecologically, and distributionally diverse. Such diversity is to be expected, in view of the mid-continental position of the State. Characteristics of insularity, owing to barriers to dispersal and movement, tend to be lacking in the makeup of the avifauna here. The State is not, of course, uniformly inhabited by all 176 species (Table 1) of breeding birds; most species vary in numbers from one place to another, and some are restricted to a fraction of the State. Variations in numbers and in absolute occurrence are chiefly a reflection of restriction or absence of certain plant formations, which is to say habitats; the analysis to follow is thus organized mainly around an examination of gross habitat-types and the birds found in them in Kansas.

TABLE 1.—THE BREEDING BIRDS OF KANSAS

Woodland Species

<i>Elanoides forficatus</i> N [A]	<i>Sitta carolinensis</i> O
<i>Ictinia mississippiensis</i> U	<i>Troglodytes aedon</i> N
<i>Accipiter striatus</i> U	<i>Thryomanes bewickii</i> N
<i>A. cooperii</i> U	<i>Thryothorus ludovicianus</i> N
<i>Buteo jamaicensis</i> O	<i>Mimus polyglottos</i> N
<i>B. lineatus</i> N	<i>Dumetella carolinensis</i> N
<i>B. platypterus</i> N	<i>Toxostoma rufum</i> N
<i>Aquila chrysaetos</i> O	<i>Turdus migratorius</i> O
<i>Falco sparverius</i> U	<i>Hylocichla mustelina</i> N
<i>Colinus virginianus</i> N	<i>Sialia sialis</i> O
<i>Phasianus colchicus</i> O	<i>Bombycilla cedrorum</i> N
<i>Meleagris gallopavo</i> N	<i>Lanius ludovicianus</i> O
<i>Philohela minor</i> U	<i>Sturnus vulgaris</i> O
<i>Zenaidura macroura</i> N	<i>Vireo atricapillus</i> N
<i>Ectopistes migratorius</i> N	<i>V. griseus</i> N
<i>Conuropsis carolinensis</i> U	<i>V. bellii</i> N
<i>Coccyzus americanus</i> N	<i>V. flavifrons</i> N
<i>C. erythrophthalmus</i> N	<i>V. olivaceus</i> N
<i>Otus asio</i> U	<i>V. gilvus</i> N
<i>Bubo virginianus</i> O	<i>Mniotilta varia</i> N
<i>Strix varia</i> U	<i>Protonotaria citrea</i> N
<i>Asio otus</i> U	<i>Parula americana</i> N
<i>Aegolius acadicus</i> U	<i>Dendroica aestiva</i> N
<i>Caprimulgus carolinensis</i> N	<i>D. discolor</i> N
<i>C. vociferus</i> U	<i>Seiurus motacilla</i> N
<i>Phalaenoptilus nuttallii</i> N	<i>Oporornis formosus</i> N
<i>Chaetura pelagica</i> U	<i>Icteria virens</i> N
<i>Archilochus colubris</i> N	<i>Wilsonia citrina</i> N
<i>Colaptes auratus</i> N	<i>Setophaga ruticilla</i> N
<i>C. cafer</i> N	<i>Passer domesticus</i> O
<i>Dryocopus pileatus</i> O	<i>Icterus spurius</i> N
<i>Centurus carolinus</i> N	<i>I. galbula</i> N
<i>Melanerpes erythrocephalus</i> N	<i>I. bullockii</i> N
<i>Dendrocopos villosus</i> O	<i>Quiscalus quiscula</i> N
<i>D. pubescens</i> O	<i>Molothrus ater</i> N
<i>Tyrannus tyrannus</i> S	<i>Piranga olivacea</i> N
<i>T. vociferans</i> S	<i>P. rubra</i> N
<i>Muscivora forficata</i> S	<i>Richmondia cardinalis</i> S
<i>Myiarchus crinitus</i> S	<i>Pheucticus melanocephala</i> S
<i>Sayornis phoebe</i> S	<i>P. ludoviciana</i> S
<i>Empidonax virescens</i> S	<i>Guiraca caerulea</i> S
<i>Contopus virens</i> S	<i>Passerina ciris</i> S
<i>Iridoprocne bicolor</i> N	<i>P. cyanea</i> S
<i>Progne subis</i> N	<i>P. amoena</i> S
<i>Cyanocitta cristata</i> N	<i>Spinus pinus</i> O
<i>Pica pica</i> O	<i>S. tristis</i> O
<i>Corvus brachyrhynchos</i> O	<i>Loxia curvirostra</i> O
<i>C. cryptoleucus</i> O	<i>Pipilo erythrophthalmus</i> N
<i>Parus atricapillus</i> O	<i>Chondestes grammacus</i> N
<i>P. carolinensis</i> O	<i>Spizella passerina</i> N
<i>P. bicolor</i> O	

Limnic Species

<i>Podilymbus podiceps</i> U	<i>Butorides virescens</i> U
<i>Phalacrocorax auritus</i> U	<i>Florida caerulea</i> U
<i>Ardea herodias</i> U	<i>Casmerodius albus</i> U
<i>Leucophoyx thula</i> U	<i>Porzana carolina</i> U
<i>Nycticorax nycticorax</i> U	<i>Laterallus jamaicensis</i> U
<i>Nyctanassa violacea</i> U	<i>Gallinula chloropus</i> U
<i>Ixobrychus exilis</i> U	<i>Fulica americana</i> U

Botaurus lentiginosis U
Plegadis chihi U
Branta canadensis U
Anas platyrhynchos U
A. acuta U
A. discors U
A. clypeata U
Aix sponsa U
Aythya americana U
Oxyura jamaicensis U
Rallus elegans U

Charadrius alexandrinus U
Actitis macularia U
Steganopus tricolor U
Sterna albifrons U
Chlidonias niger U
Telmatodytes palustris N
Cistothorus platensis N
Geothlypis trichas N
Xanthocephalus xanthocephalus N
Agelaius phoeniceus N
Rallus limicola U

Grassland Species

Buteo swainsonii N
B. regalis U
Circus cyaneus O
Tympanuchus cupido N
T. pallidicinctus N
Pedioecetes phasianellus N
Charadrius vociferus U
Eupoda montana U
Numenius americanus U
Bartramia longicauda U
Speotyto cunicularia U
Asio flammeus U

Sayornis saya S
Eremophila alpestris O
Dolichonyx oryzivorus N
Sturnella magna N
S. neglecta N
Spiza americana N
Calamospiza melanocorys N
Ammodramus savannarum N
Passerherbulus henslowii N
Aimophila cassinii N
Spizella pusilla N

Xeric Scrub Species

[Pg 581]

Callipepla squamata N
Salpinctes obsoletus N

Geococcyx californianus N

Unanalyzed Species

Cathartes aura N
Coragyps atratus N
Falco peregrinus U
Columba livia O
Tyto alba U
Petrochelidon pyrrhonota U

Chordeiles minor U
Megasceryle alcyon U
Riparia riparia O
Stelgidopteryx ruficollis N
Hirundo rustica O

[A] The letter following each name refers to presumed zoogeographic derivation of the species, modified after Mayr (1946). N = North American evolutionary stock; S = South American stock; O = Eurasian stock; U = unanalyzed.

[^TOC]

Avian Habitats in Kansas

Four major habitat-types can be seen in looking at the distribution of the breeding avifauna of Kansas. These are woodland, grassland, limnic, and xeric scrub plant formations. A little more than half the breeding birds of Kansas live in woodland habitats, about one-fifth in limnic habitats, about one-eighth in grassland habitats, and less than two per cent in scrub habitats; this leaves some 6.4 per cent of the breeding avifauna unanalyzed ([Table 2](#)).

TABLE 2.—ANALYSIS OF THE BREEDING AVIFAUNA OF KANSAS BY HABITAT-TYPES

HABITAT-TYPE	Percentage of the Avifauna of		
	Kansas	North America	Stated Habitat
Woodland: 101 species	58	16.7	44.4
Limnic: 36 species [B]	21	6.0	38.5
Grassland: 23 species	13	3.8	71.3
Xeric scrub: 3 species	2	0.5	10.2
Unanalyzed: 11 species	6	2.0	55.0
Totals: 174 species	100	29.0	43.2

[B] Does not include the Canvasback (*Aythya valisineria*), the Forster Tern (*Sterna forsteri*), and the Black Tern (*Chlidonias niger*), all recently added to the breeding avifauna of Kansas.

Woodland Habitats

One hundred one species of Kansan birds are woodland species (tables 1 and 2). The analysis of Udvardy (1958) showed woodland birds to be the largest single avifaunal element in North America, with 38 per cent of North American birds relegated to it. It is likewise the largest element in the Kansan avifauna, representing 58 per cent of Kansan birds. Although woodland makes up a relatively small fraction of the vegetational complexes in Kansas, a large number of habitats exist in what woodland is present. An even larger number of possible woodland habitats is clearly missing, however, because the 101 Kansan species actually represent but 44 per cent of all woodland birds in North America, according to Udvardy's analysis. Broad-leaved, deciduous woodlands in Kansas are of restricted horizontal and vertical stratification. More complex deciduous forest associations and all coniferous forest associations are absent from the State.

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Using Mayr's (1946) breakdown of geographical origin of the North American bird fauna, about 53 per cent of the woodland passerine birds in Kansas are of "North American" origin, 22 per cent are of "Eurasian" origin, and 14 per cent are of "South American" origin (Table 3). These figures for Kansas are commensurate with those found for other geographic districts at the same latitude in North America (Mayr, 1946:28). Other characteristics of woodland birds are summarized in tables 4 and 5.

TABLE 3.—ANALYSIS OF ECOLOGIC GROUPS OF BIRDS BY STATUS OF RESIDENCY AND AREA OF ORIGIN

	Migrant	Resident	Pt. Migr.	Old World	N. Amer.	S. Amer.	Unanalyzed
Woodland species, 101:58%	60%	29%	11%	22%	53%	14%	11%
Limnic species, 36:21%	94%	0	6%	0	14%	0	86%
Grassland species, 23:13%	61%	26%	13%	9%	56%	3%	30%
Xeric Scrub species, 3:2%	33%	66%	0	0	100%	0	0
Unanalyzed species, 11:6%	64%	27%	9%	26%	26%	0	48%

Limnic Habitats

Of Kansan birds, 36 species (20 per cent) prefer limnic habitats (Table 1). Udvardy found this group to represent 15 per cent of the North American avifauna. Kansas is not notably satisfactory for limnic species, and only 38 per cent of the total North American limnic avifauna is present in the State.

Thirty-one species of limnic birds belong to families that Mayr (1946) considered to be unanalyzable as to their geographic origin; of the five remaining species, all seem to be of North American origin. Other characteristics of limnic birds are summarized in tables 4 and 5.

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Grassland Habitats

Twenty-three species of our total can be called grassland species (Table 1). The subtotal is less than one-fifth of the Kansan avifauna, but it represents 72 per cent of the grassland birds of North America; grassland habitats abound in Kansas. Only 5.3 per cent of all North American birds are grassland species (Udvardy, 1958).

About 56 per cent of these birds are of North American stocks, nine per cent of Eurasian stocks, and three per cent of South American stocks. The percentage of North American species is the greatest for any habitat group here considered. Other characteristics of grassland birds are summarized in tables 4 and 5.

TABLE 4.—ANALYSIS BY HABITAT-TYPE AND RESIDENCY STATUS OF HISTORIC AVIAN STOCKS IN KANSAS

	Woodland	Limnic	Grassland	Xeric Scrub	Unanal. Hab.	Migrant	Resident	Partly Migrant
Old World Element 27:16%	0%	0	8%	0	12%	11%	78%	11%
North American Element 77:44%	69%	6%	17%	4%	4%	72%	14%	14%
South American Element	93%	0	7%	0	0	93%	7%	0

15:8%									
Unanalyzed Origin 53:32%	22%	56%	13%	0	9%	79%	16%	5%	

Xeric-Scrub Habitats

Three species of Kansan birds can be placed in this category ([Table 1](#)). This is less than one per cent of the North American avifauna, two per cent of the Kansan avifauna, and ten per cent of the birds of xeric scrub habitats in North America. The three species are considered to be of North American origin.

Unanalyzed as to Habitat

Eleven species of Kansan birds could not be assigned to any of the habitat-types mentioned above. The total represents two per cent of the North American avifauna, six per cent of the birds of Kansas, and 55 per cent of the species reckoned by Udvardy (*loc. cit.*) to be unanalyzable. Fifty-five per cent is a large fraction, but only to be expected: species are considered unanalyzable if they show a broad, indiscriminate use of more than one habitat-type, and such birds tend to be widely distributed.

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TABLE 5.—ANALYSIS BY ECOLOGIC STATUS AND AREA OF ORIGIN OF MIGRANT AND RESIDENT BIRDS

	Woodland	Limnic	Grassland	Xeric Scrub	Unanal. Hab.	Old World	N. Amer.	S. Amer.	Unanalyzed
Migrant species 117:67%	52%	29%	12%	1%	6%	2%	49%	12%	37%
Resident species 40:23%	73%	0	15%	5%	7%	51%	26%	2%	21%
Partly migrant 17:10%	64%	11%	17%	0	6%	17%	66%	0	17%

[\[^ TOC \]](#)

Species Reaching Distributional Limits in Kansas

The distributional limits of a species are useful in indicating certain of its adaptive capacities and implying maintenance of or shifts in characteristics of habitats. Although it is generally an oversimplification to ignore abundance when treating of distribution, the present remarks of necessity do not pertain to abundance.

TABLE 6.—BREEDING BIRDS REACHING DISTRIBUTIONAL LIMITS IN KANSAS

Species reaching northern distributional limits

<i>Florida caerulea</i>	<i>Geococcyx californianus</i>
<i>Leucophoyx thula</i>	<i>Caprimulgus carolinensis</i>
<i>Coragyps atratus</i>	<i>Muscivora forficata</i>
<i>Elanoides forficatus</i>	<i>Parus carolinensis</i>
<i>Ictinia mississippiensis</i>	<i>Vireo atricapillus</i>
<i>Tympanuchus pallidicinctus</i>	<i>Passerina ciris</i>
<i>Callipepla squamata</i>	<i>Aimophila cassinii</i>

Species reaching southern distributional limits

<i>Aythya americana</i>	<i>Pedioecetes phasianellus</i>
<i>Parus atricapillus</i>	<i>Empidonax minimus</i>
<i>Bombycilla cedrorum</i>	<i>Steganopus tricolor</i>
<i>Dolichonyx oryzivorus</i>	<i>Chlidonias niger</i>

Coccyzus erythrophthalmus

Species reaching eastern distributional limits

<i>Eupoda montana</i>	<i>Sayornis saya</i>
<i>Numenius americanus</i>	<i>Corvus cryptoleucus</i>
<i>Phalaenoptilus nuttallii</i>	<i>Salpinctes obsoletus</i>
<i>Colaptes cafer</i>	<i>Icterus bullockii</i>

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Species reaching western distributional limits

<i>Aix sponsa</i>	<i>Hylocichla mustelina</i>
<i>Buteo platypterus</i>	<i>Vireo griseus</i>
<i>Philohela minor</i>	<i>V. flavifrons</i>
<i>Ectopistes migratorius</i>	<i>Mniotilta varia</i>
<i>Conuropsis carolinensis</i>	<i>Protonotaria citrea</i>
<i>Chaetura pelagica</i>	<i>Parula americana</i>
<i>Archilochus colubris</i>	<i>Dendroica discolor</i>
<i>Dryocopus pileatus</i>	<i>Seiurus motacilla</i>
<i>Centurus carolinus</i>	<i>Oporornis formosus</i>
<i>Myiarchus crinitus</i>	<i>Wilsonia citrina</i>
<i>Empidonax virescens</i>	<i>Setophaga ruticilla</i>
<i>E. traillii</i>	<i>Sturnella magna</i>
<i>Parus bicolor</i>	<i>Piranga olivacea</i>
<i>Thryothorus ludovicianus</i>	<i>Pheucticus ludovicianus</i>
<i>Cistothorus platensis</i>	<i>Pipilo erythrophthalmus</i>
	<i>Passerherbulus henslowii</i>

Western Limits Reached in Kansas

Thirty-one species (tables 6 and 7) reach the western limits of their distribution somewhere in Kansas. Most of these limits are in eastern Kansas, and coincide with the gradual disappearance of the eastern deciduous forest formation. Twenty-nine species are woodland birds, and few of these seem to find satisfactory conditions in the riparian woods extending out through western Kansas. The Wood Thrush is the one woodland species that has been found nesting in the west (Decatur County; Wolfe, 1961). Descriptively, therefore, the dominant reason for the existence of distributional limits in at least 28 of these birds is the lack of suitable woodland in western Kansas; these 28 are the largest single group reaching distributional limits in the State. Many other eastern woodland birds occur in western Kansas along riparian woodlands, as is mentioned below.

Two species showing western limits in Kansas are characteristic of grassland habitats; the Eastern Meadowlark seems to disappear with absence of moist or bottomland prairie grassland and the Henslow Sparrow may be limited westerly by disappearance of tall-grass prairie.

The Short-billed Marsh Wren, a marginal limnic species, reaches its southwesterly mid-continental breeding limits in northeastern Kansas. The species breeds in Kansas in two or three years of each ten, in summers having unusually high humidity.

Northern Limits Reached in Kansas

Fourteen species (tables 6 and 7) reach their northern distributional limits in Kansas. Eight of these are birds of woodland habitats, but of these only the Carolina Chickadee is a species of the eastern deciduous woodlands; the other seven live in less mesic woodland. Three of these species (Chuck-will's-Widow, Scissor-tailed Flycatcher and Painted Bunting) have breeding ranges that suggest the northwesterly occurrences of summer humid warm air masses ("gulf fronts") and this environmental feature perhaps is of major importance for these birds, as it is also for the vegetational substratum in which the birds live.

The Lesser Prairie Chicken and the Cassin Sparrow are the two birds of grasslands that are limited northerly in Kansas. Xeric, sandy grassland is chiefly limited to the southwestern quarter of Kansas, and this limitation is perhaps of major significance to these two species. The Scaled Quail and Roadrunner tend to drop out as the xeric "desert scrub" conditions of the southwest drop out in Kansas.

TABLE 7.—ANALYSIS BY HABITAT-TYPE OF BIRDS REACHING DISTRIBUTIONAL LIMITS IN KANSAS

DIRECTIONAL LIMIT	Habitat-types				Total
	Woodland	Grassland	Limnic	Xeric Scrub	
Western extent	28	2	2	0	31
Northern extent	8	2	2	2	14
Eastern extent	6	4	0	2	11
Southern extent	4	2	3	0	9
Totals	46	10	6	3	65

Per cent of the Species in Stated Habitat	46	43	14	100	37
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Eastern Limits Reached in Kansas

Eleven species (tables 6 and 7) reach their eastern distributional limits in Kansas. Six of these are woodland birds. Four of these are members of well-known species-pairs: the Red-shafted Flicker, Bullock Oriole, Black-headed Grosbeak, and Lazuli Bunting. Presence to the east of complementary species has much to do with the absence of these species in eastern Kansas. Four of the eleven are birds of grasslands, and they drop out as the short-grass prairie is restricted easterly.

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The Rock Wren may be considered characteristic of xeric scrub in Kansas, and it is not found to the east in the absence of such scrub.

Southern Limits Reached in Kansas

Eight species (tables 6 and 7) reach their southern distributional limits in Kansas. Half of these birds are of woodland habitats, and of these four, the Black-capped Chickadee and Cedar Waxwing are chiefly of sub-boreal distribution. The Black-capped Chickadee also finds its niche partly pre-empted in southern Kansas by the Carolina Chickadee.

The Bobolink and Sharp-tailed Grouse are grassland species that are seemingly adapted to cooler, dryer grassland than is found in most of Kansas.

The Redhead, Wilson Phalarope, and Black Tern are limnic species, perhaps limited southerly by high summer temperatures; the three species are entirely marginal anywhere in Kansas.

TABLE 8.—BIRDS OF THE EASTERN DECIDUOUS FOREST FOUND IN WESTERN KANSAS IN RIPARIAN WOODLAND

<i>Accipiter cooperii</i> ^[C]	<i>Toxostoma rufum</i>
<i>Coccyzus americanus</i> ^[C]	<i>Sialia sialis</i>
<i>Centurus carolinus</i>	<i>Vireo olivaceus</i>
<i>Melanerpes erythrocephalus</i>	<i>Icterus spurius</i> ^[C]
<i>Tyrannus tyrannus</i>	<i>Icterus galbula</i>
<i>Myiarchus crinitus</i>	<i>Quiscalus quiscalus</i>
<i>Contopus virens</i>	<i>Piranga rubra</i> ^[C]
<i>Sayornis phoebe</i>	<i>Passerina cyanea</i>
<i>Cyanocitta cristata</i>	<i>Richmondia cardinalis</i>
<i>Dumetella carolinensis</i>	<i>Pipilo erythrophthalmus</i> ^[C]
	<i>Spizella passerina</i> ^[C]

[C] Breeds farther west in North America in other types of vegetation.

Influence of Riparian Woodland

Although the largest single element of the Kansan avifauna that reaches distributional limits in Kansas is made up of birds of the eastern deciduous forest, several species of the eastern woodlands are present in Kansas along the east-west river drainages in riparian woodland; the species are listed in Table 8. Twenty-one kinds are involved if we include the Cooper Hawk, Yellow-billed Cuckoo, Orchard Oriole, Summer Tanager, Rufous-sided Towhee, and Chipping Sparrow, all of which breed farther to the west but are present in western Kansas only along river drainages. This leaves 15 species of eastern deciduous woodlands that occur west in Kansas along riparian woodland (*versus* 30 species that drop out chiefly where eastern woodland drops out). These 15 species are about one-third of all woodland birds in western Kansas. Riparian woodland does not seem to afford first-rate habitat for most of the eastern woodland species that do occur; breeding density seems to be much lower than in well-situated eastern woodland.

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The importance of these linear woodlands as avenues for gene-flow between eastern and western populations, especially of species-pairs (grosbeaks, flickers, orioles, and buntings), is obviously great. Likewise significant is the existence of these alleys for dispersal from the west of certain species (for instance, the Black-billed Magpie and the Scrub Jay) into new but potentially suitable areas.

BREEDING SEASONS

Introduction

An examination of breeding seasons or schedules is properly undertaken at several levels. The fundamental description of variation in breeding schedules must itself be detailed in several ways and beyond this there are causal factors needing examination. The material below is a summary of the information on breeding schedules of birds in Kansas, treated descriptively and analytically in ways now thought to be of use.

Almost any event in actual reproductive activity has been used in the following report; nestbuilding, egg-laying, incubation, brooding of young, feeding of young out of the nest are considered to be of equal status. To any such event days are added or subtracted from the date of observation so as to yield the date when the clutch under consideration was completed.

Such corrected dates can be used in making histograms that show the time of primary breeding activity, or the "egg-season." All such schedules are generalizations; data are used for a species from any year of observation, whether 50 years ago or less than one year ago. One advantage of such procedure is that averages and modes are thus more nearly representative of the basic temporal adaptations of the species involved, as is explained below.

When information on the schedule of a species from one year is lumped with information from another year or other years, two (and ordinarily more than two) frequency distributions are used to make one frequency distribution. The great advantage here is that the frequency distribution composed of two or more frequency distributions is more stable than any one of its components. Second, the peak of the season, the mode of egg-laying, is represented more broadly than it would have been for any one year alone. Third, the extremes of breeding activity are fairly shown as of minute frequency and thus of limited importance, which would not be true if just one year were graphed. All these considerations combine to support the idea that general schedules in fact represent the basic temporal adaptations of a species much better than schedules for one year only.

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Variation in Breeding Seasons

In the chronology of breeding seasons of birds, there are three basic variables: time at which seasons begin, time at which seasons end, and time in which the major breeding effort occurs. These variables have been examined in one population through time (Lack, 1947; Snow, 1955; Johnston, 1956), in several populations of many species over wide geographic ranges (Baker, 1938; Moreau, 1950; Davis, 1953), and in several populations of one species (Lack, *loc. cit.*; Paynter, 1954; Johnston, 1954). The analysis below is concerned with breeding of many kinds of birds of an arbitrarily defined area and with the influence of certain ecologic and zoogeographic factors on the breeding seasons for those several species.

THE INFLUENCE OF SEASONAL STATUS.—Here we are interested in whether a species is broadly resident or migrant in Kansas; 70 species are available for analysis.

Resident Species

Twenty-four species, furnishing 875 records of breeding, are here considered to be resident birds in northeastern Kansas. These species are Cooper Hawk, Red-tailed Hawk, Prairie Chicken, Bobwhite, Rock Dove, Great Horned Owl, Red-bellied Woodpecker, Hairy Woodpecker, Downy Woodpecker, Horned Lark, Blue Jay, Common Crow, Black-billed Magpie, Black-capped Chickadee, Tufted Titmouse, Carolina Wren, Bewick Wren, Mockingbird, Eastern Bluebird, Loggerhead Shrike, Starling, House Sparrow, Eastern Meadowlark, and Cardinal. The distribution of completed clutches ([Fig. 1](#)) runs from mid-January to mid-September, with a modal period in the first third of May. Conspicuous breeding activity occurs from mid-April to the first third of June.

Migrant Species

Forty-six species, furnishing 2,522 records of breeding, are considered to be migrant in northeastern Kansas. These species are Great Blue Heron, Green Heron, Swainson Hawk, American Coot, Killdeer, Upland Plover, American Avocet, Least Tern, Yellow-billed Cuckoo, Black-billed Cuckoo, Burrowing Owl, Common Nighthawk, Chimney Swift, Red-headed

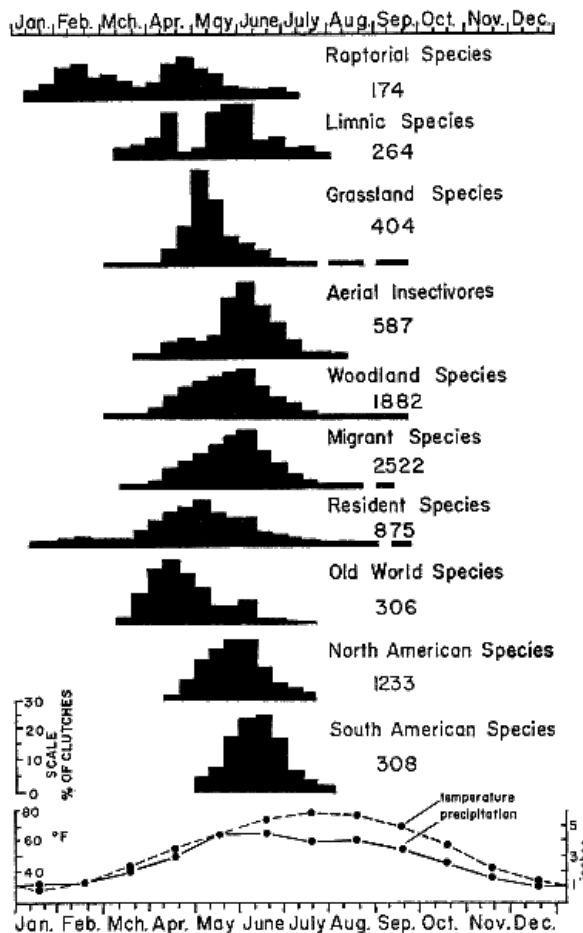
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Woodpecker, Eastern Kingbird, Western Kingbird, Scissor-tailed Flycatcher, Great Crested Flycatcher, Eastern Phoebe, Eastern Wood Pewee, Bank Swallow, Rough-winged Swallow, Barn Swallow, Purple Martin, Brown Thrasher, Catbird, House Wren, Robin, Wood Thrush, Blue-gray Gnatcatcher, Bell Vireo, Warbling Vireo, Prothonotary Warbler, Yellow Warbler, Chat, Western Meadowlark, Red-winged Blackbird, Orchard Oriole, Baltimore Oriole, Common Grackle, Black-headed Grosbeak, Indigo Bunting, Dickcissel, Lark Sparrow, and Field Sparrow. The distribution of completed clutches runs from mid-March to the first third of September, with a modal period of egg-laying in the first third of June (Fig. 1). Conspicuous breeding activity occurs from the first third of May to the last third of June.

THE INFLUENCE OF DOMINANT FORAGING ADAPTATION.—Five categories here considered reflect broad foraging adaptation: woodland species, taking invertebrate foods in the breeding season from woody vegetation or the soil within wooded habitats; grassland species, taking invertebrate foods in the breeding season from within grassland situations; limnic species, foraging within marshy or aquatic habitats; aerial species, foraging on aerial arthropods; raptors, feeding on vertebrates or large insects.

Raptors

Six species, furnishing 174 records of breeding, are here considered, as follows: Cooper Hawk, Red-tailed Hawk, Swainson Hawk, Great Horned Owl, Burrowing Owl, and Loggerhead Shrike. The distribution of clutches (Fig. 1) runs from mid-January to the first third of July and is bimodal. One period of egg-laying occurs in mid-February and a second in the last third of April. Such a distribution indicates that two basically independent groups of birds are being considered. The first peak of laying reflects activities of the large raptors, and the second peak is that of the insectivorous Burrowing Owl and Loggerhead Shrike. The peak for these two birds is most nearly coincident with that for grassland species, a category to which the Burrowing Owl might well be relegated.



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FIG. 1.—Histograms representing breeding schedules of ten categories of Kansan birds. Heights of columns indicate percentage of total of clutches of eggs, and widths indicate ten-day intervals of time, with the 5th, 15th, and 25th of each month as medians. The occurrences of monthly means of temperature and precipitation are indicated at the bottom of the figure.

Limnic Species

Six species, the Great Blue Heron, Green Heron, American Coot, American Avocet, Least Tern and Red-winged Blackbird, furnish 264 records of breeding. The distribution of clutches (Fig. 1) runs from mid-March to the last third of July and is bimodal. This is another

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heterogeneous assemblage of birds; the Great Blue Heron is responsible for the first peak, in the first third of April. The other five species, however, show fair consistency and their peak of egg-laying almost coincides with peaks for aerial foragers, woodland species, and migrants, considered elsewhere in this section.

Grassland Species

Ten species, Greater Prairie Chicken, Bobwhite, Killdeer, Upland Plover, Horned Lark, Starling, Eastern Meadowlark, Western Meadowlark, Common Grackle, and Dickcissel, furnish 404 records of breeding activity. The distribution of clutches ([Fig. 1](#)) runs from the first of March to mid-September. The peak of egg-laying occurs in the first third of May. This is coincident with the peak for resident species, perhaps a reflection of the fact that half the species in the present category are residents in northeastern Kansas.

Woodland Species

In this category are included species characteristic of woodland edge. Thirty-four species, furnishing 1,882 records of breeding, are here treated: Yellow-billed Cuckoo, Black-billed Cuckoo, "flicker" (includes birds thought to be relatively pure red-shafted, pure yellow-shafted, as well as clear hybrids), Red-bellied Woodpecker, Red-headed Woodpecker, Hairy Woodpecker, Downy Woodpecker, Blue Jay, Black-billed Magpie, Common Crow, Black-capped Chickadee, Tufted Titmouse, Carolina Wren, Bewick Wren, House Wren, Brown Thrasher, Catbird, Mockingbird, Robin, Wood Thrush, Eastern Bluebird, Blue-gray Gnatcatcher, Bell Vireo, Warbling Vireo, Prothonotary Warbler, Yellow Warbler, Chat, Orchard Oriole, Baltimore Oriole, Cardinal, Black-headed Grosbeak, Indigo Bunting, Lark Sparrow, and Field Sparrow. The distribution of clutches runs from the first third of March to mid-September ([Fig. 1](#)). The modal period for completed clutches is the first third of June. Conspicuous breeding activity occurs from the first third of May to mid-June. The distribution of the season in time is almost identical with that for migrant species, reflecting the large number of migrant species in woodland habitats in Kansas.

Aerial Foragers

Twelve species, Common Nighthawk, Chimney Swift, Eastern Kingbird, Western Kingbird, Scissor-tailed Flycatcher, Great Crested Flycatcher, Eastern Phoebe, Eastern Wood Pewee, Bank Swallow, Rough-winged Swallow, Barn Swallow, and Purple Martin, furnish 587 records of breeding. The distribution of clutches ([Fig. 1](#)) extends from the last third of March to the first third of August, and the modal date of clutches is in the first third of June. Conspicuous breeding activity occurs from the end of May to the end of June. The peak of nesting essentially coincides with that characteristic of migrants.

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Zoogeographic Categories

Three categories of Mayr (1946) are of use in analyzing trends in breeding schedules of birds in Kansas. These categories of presumed ultimate evolutionary origin are the "Old World Element," the "North American Element," and the "South American Element." Not always have I agreed with Mayr's assignments of species to these categories, and such differences are noted. There is some obvious overlap between these categories and those discussed previously.

Old World Element

Eighteen species, Red-tailed Hawk, Rock Dove, Great Horned Owl, Hairy Woodpecker, Downy Woodpecker, Black-billed Magpie, Common Crow, Black-capped Chickadee, Tufted Titmouse, Robin, Loggerhead Shrike, Starling, House Sparrow, Bank Swallow, Barn Swallow, and Blue-gray Gnatcatcher, furnish 969 records of breeding ([Fig. 1](#)). Species for which I have records but which are not here listed are the Blue Jay and the Wood Thrush, both of which I consider to be better placed with the North American Element. The distribution of completed clutches runs from mid-January to the first third of August, and shows a tendency toward bimodality. The second, smaller peak is due to the inclusion of relatively large samples of three migrant species (Robin, Bank Swallow, and Barn Swallow). The timing of the breeding seasons of these three species is in every respect like that of most other migrants; if they are removed from the present sample the bimodality disappears, indicating an increase in homogeneity of

the unit.

North American Element

Twenty-six species, Greater Prairie Chicken, Bobwhite, "flicker," Rough-winged Swallow, Purple Martin, Blue Jay, Carolina Wren, Bewick Wren, House Wren, Mockingbird, Catbird, Brown Thrasher, Wood Thrush, Bell Vireo, Warbling Vireo, Prothonotary Warbler, Yellow Warbler, Chat, Eastern Meadowlark, Western Meadowlark, Red-winged Blackbird, Orchard Oriole, Baltimore Oriole, Common Grackle, Lark Sparrow, and Field Sparrow, furnish 1,233 records of breeding ([Fig. 1](#)). The distribution of completed clutches runs from the first third of April to the first third of September. The modal date for completion of clutches is June 1.

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South American Element

Twelve species, Eastern Kingbird, Western Kingbird, Scissor-tailed Flycatcher, Great Crested Flycatcher, Yellow-bellied Flycatcher, Traill Flycatcher, Eastern Wood Pewee, Eastern Phoebe, Cardinal, Black-headed Grosbeak, Rose-breasted Grosbeak, and Indigo Bunting, furnish 552 records of breeding ([Fig. 1](#)). The curve representing this summary schedule is bimodal, wholly as a result of including the Eastern Phoebe and the Cardinal with this sample.

Relationship of Schedules to Temperature and Precipitation

In outlining the ten categories above, attention has been given to certain similarities and differences in the frequency distributions. A slightly more refined way of comparing the frequency distributions is to relate them to other, seasonally variable phenomena. Figure 1 shows the frequency distributions of egg-laying of these ten categories of birds in terms of the regular changes in mean temperature and mean precipitation characteristic of the environments in which these birds live in the breeding season.

[Table 9](#) shows that there are two basic groups of birds according to peak of egg-laying and incidence of precipitation; raptors, birds of Eurasian origin, resident birds, and birds of grassland habitats tend to have their peaks of egg-laying prior to the peak of spring-summer rains, and the other six categories tend to have their peaks of egg-laying occur in the time of spring-summer rains. Regarding temperature, there are four categories of birds; these are evident in the table.

Some of the correspondences deserve comment. Residents and grassland species both breed before the rains come and before mean temperatures reach 70°F., and this correspondence probably results from most of the grassland species being residents. Contrariwise, most birds of Eurasian stocks are residents, but not all residents are of such stocks; the two groups are discrete when mean temperature at breeding is considered. Woodland birds, aerial foragers, and birds of South American evolutionary stocks breed after temperatures surpass 70°F. on the average. Almost all such species are migrants, but many migrants have different temporal characteristics, and the categories thus are shown to be discrete on the basis of temperature at time of breeding. The change through spring and summer of temperature and precipitation delineates the inception and waxing of the growing season of vegetation and of the subsequent arthropod populations, on which most of the birds feed in the breeding season. The temporal characteristics of growing seasons in North America have been treated by Hopkins (1938) and have been related to timing of breeding seasons in Song Sparrows (*Passerella melodia*) of the Pacific coast of North America (Johnston, 1954).

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Significance of Phylogeny to Breeding Schedules

Evidence from a variety of sources demonstrates that timing of breeding seasons is either broadly or specifically genetically-determined. For some species in some situations major environmental variables are paramount in regulating timing of breeding, but in others the innate, regulatory "clock" is less closely tied to conspicuous exogenous stimuli. The work by Miller (1955a, 1955b, 1960) with several species of *Zonotrichia* strongly indicates that endogenous timing is most important for these birds, and there is ecological evidence for Song Sparrows that supports the same point (Johnston, 1954, 1956). It is, in any event, possible to treat breeding schedules as species-specific characters, for any one geographic area.

In an attempt to relate a breeding schedule to previous ancestral modes, that is by extension to phylogeny, it is necessary to know how often ancestral adaptations can persist in the face of necessity to adapt to present environmental conditions. It is necessary to know how

conservative or how immediately plastic breeding schedules can be. The disadvantage of using available information about configurations of breeding seasons (as shown in Figs. 3 to 9) is that it is extremely difficult to compare visually at one time more than six or eight histograms as to the trenchant similarities and differences regarding times of inception and cessation of breeding, and time of peak egg-laying. It is possible, however, to reduce these three variables to one variable (as described below), which allows the necessary comparisons to be made more easily; this variable may be called the *breeding index*.

Calculation of Breeding Index

The chronological year is broken roughly into ten-day intervals numbered 1 to 36. The histogram describing the temporal occurrence of the breeding season of a species in our area usually will lie within intervals 7 to 25. The modal date for completion of clutches is given a value corresponding to the number of ten-day intervals beyond interval 7 (March 1-10); this describes the modal variable. The date of completion of 83 per cent of all clutches is given a value corresponding to the number of ten-day intervals it lies from interval 11 (April 11-20); this describes the 83 per cent variable (and is a measure of the length of the season in terms of its inception). The breeding index can then be calculated as follows:

$$I = X_m + X_{sd},$$

where: I is the breeding index,

X_m is the modal variable, and

X_{sd} is the 83 per cent variable.

This is obviously an arbitrary scheme to gain a simple measure of beginning, peak, and end of a breeding season. Other schemes could be devised whereby different absolute values would be involved, but the relative nature of the results would be preserved. The values under the present system for 73 species of Kansan birds run from -5 to +22; early modal dates and cessation to breeding give low values, late dates high values.

Within this framework there are other, presumably subordinate, factors that influence the values of breeding indices, as follows:

1. Migratory habit. Any migrant tends to arrive on breeding grounds relatively late, hence migrants ordinarily have higher index values than do residents.

2. Colonial breeding. The strong synchrony of colonially-breeding species tends to move the modal egg-date toward the time of inception of breeding; as a result colonially-breeding species probably have lower index values than they would have if not colonial.

3. Single-broodedness. Species having only one brood per season tend to have shorter seasons than double-brooded species, and their index values tend to be lower than those of double-brooded species.

Migratory habit unquestionably has considerable influence on index values in some species. It is not, however, as important as other matters, such as the condition of the food substratum or sensitivity of the pituitary-gonadal mechanism, in determining timing and mode of breeding activity. The schedule of the Purple Martin is the extreme example showing that time of spring arrival on breeding grounds is not necessarily related to time of inception of breeding. It should be emphasized that the factors leading to northward migratory movement may be involved in timing of the annual gonadal and reproductive cycle.

Figure 2 presents a graphic summary of values of breeding indices for many groups of Kansan birds. The values for species of a given family have been linked by a horizontal line. The length of this line is proportional to the degree to which the index values for the species concerned resemble one another. Note that the plottings for the Picidae, Corvidae, Turdidae, Tyrannidae, and Icteridae each contain one point that is well-removed from a cluster of points. This can be interpreted as a measure of the frequency of adaptive plasticity versus adaptive conservatism; five of the 24 plottings show a plastic character, 19 a conservative. There are 26 plottings that show temporal consistency, all of which may be taken as evidence of adaptive (or relictual) conservatism of the species in question.

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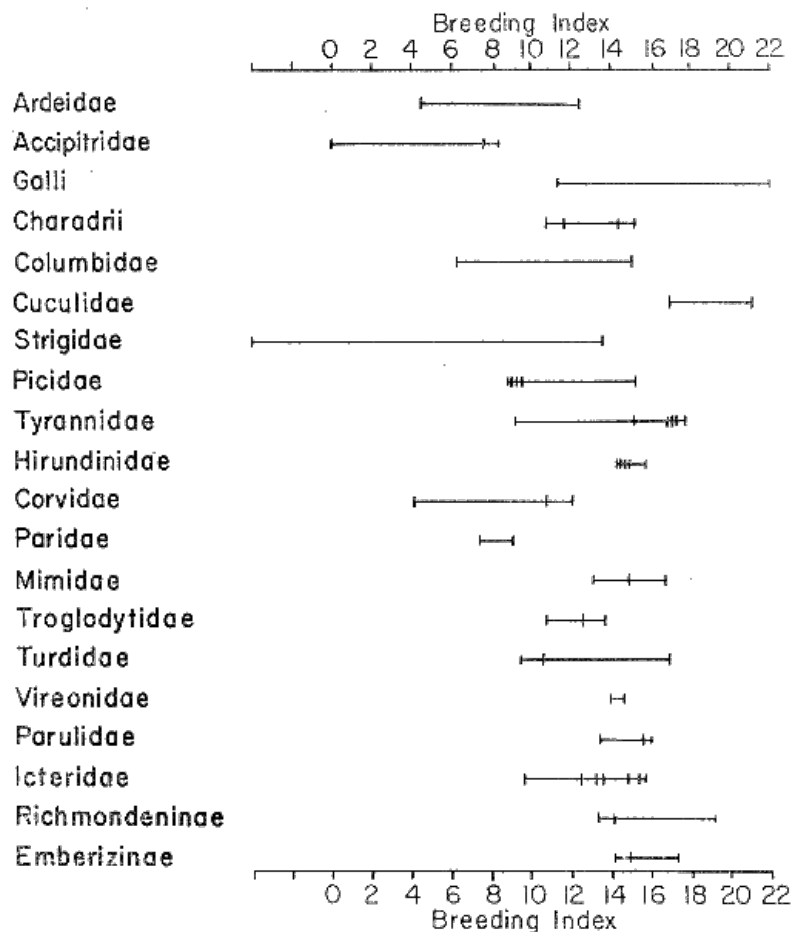


FIG. 2.—Breeding indices for Kansan birds. Vertical hash-marks indicate the value of breeding index for a given species; horizontal lines show the range of values of breeding index for families and orders.

Conclusion

Such patterns of breeding chronology support the idea that seasonal response to the necessities of breeding is conservative more often than plastic. Most students of breeding schedules believe that since these are highly adaptive, they must also be capable of flexibility to meet variable environments within the range of the species. Such thinking receives support when different geographic localities are considered for one species (Johnston, 1954), or when specific features of a special environment are considered (see Miller, 1960; Johnston, 1956).

Yet, if one, relatively restricted locality is considered, as in the present study, evidence of a conservative characteristic in breeding schedules can be detected. This conservatism may result from the historic genetic "burden" of the species; that is to say, previous adaptive peaks may in part be evident in the matrix of contemporary adaptation. Adaptive relicts of morphological nature have been many times documented, but characteristics associated with seasonality and timing schedules have not.

In any event, genetic relationships are evident in the configuration of breeding seasons of many species here treated. Thus, any consideration of variation in breeding schedules must be sensitive to the limits, whether broad or restricting, that the heritage of a species sets on its present chronological adaptation.

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Regulation of Breeding Schedules

Regulation of breeding schedules in birds always involves some exogenous, environmental timing or triggering mechanism. Broad limits to functional reproductive activity seem to be set by the photoperiod—neuroendocrine system. This basic, predominately extra-equatorial, regulator can be ignored by temperate-zone species only if they possess chronological adaptation to special, aperiodic environmental conditions, as does the Red Crossbill (*Loxia curvirostra*; see McCabe and McCabe, 1933; H. B. Tordoff, ms.), for which the chief consideration seems to be availability of conifer seeds. Environmental phenomena otherwise known to trigger breeding activity include rainfall (Davis, 1953; Williamson, 1956), presence of suitable nesting material (Marshall and Disney, 1957; Lehrman, 1958), temperature (Nice,

1937), and presence of a mate (Lehrman, Brody, and Wortis, 1961). Such regulators, or environmental oscillators, are the "phasing factors" of the physiologic clock that dictate the temporal occurrence of primary reproductive activity.

None of the regulators mentioned above has been specifically investigated for any Kansan bird, but it is reasonable to suppose that, in these temperate-zone species, the photoperiod is the most important general phasing factor in seasonal breeding. Although gonadal response and seasonal restriction of breeding are set by the photoperiod, specific temporal relationships are dictated by more immediate environmental variables.

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TABLE 9.—RELATIONSHIP BETWEEN ENVIRONMENTAL FACTORS AND TIMING OF BREEDING IN BIRDS OF KANSAS

	Occurrence of Peak of Egg-laying					
	When Precipitation is:		When Mean Temperature (F.) is:			
	Light	Heavy	< 55°	< 70°	± 70°	> 70°
Raptors	x		x			
O. W. Element	x		x			
Residents	x			x		
Grassland species	x			x		
Marshland species		x			x	
N. Amer. Element		x			x	
Migrants		x			x	
Woodland species		x				x
Aerial foragers		x				x
S. Amer. Element		x				x

Table 9, as already noted, shows the gross relationships between certain groups of birds, certain arbitrary indicators of seasonal temperature-humidity conditions bearing significantly on the growing season, and occurrence in time of peak of egg-laying by the birds involved. Some species and groups of Kansan birds breed chiefly under cool-dry environmental conditions, and some under warm-wet environmental conditions. Within each of these categories some variation occurs. Thus, raptors and boreally-adapted species (the Eurasian zoogeographic element) breed under cool conditions prior to rains, and residents and grassland species breed under slightly warmer conditions prior to rains; limnic species, species derived from North American evolutionary stocks, and migrants tend to breed in the cooler segment of the warm-wet period, and woodland birds, aerial foragers, and species derived from South American evolutionary stocks tend to breed in the warmer segment of the warm-wet period.

So much, then, for relationships between birds and their environments at a descriptive level. It would be useful at this point to examine how environmental variables relate to timing of breeding. Certain independent lines of investigation indicate that birds have a well-developed internal timing device; most convincing is the work of Schmidt-Koenig (1960) and the others who have shown that the endogenous clock of birds can be shifted in its periodicity forward or backward in time. This and much other evidence (see Brown, 1960) indicate that many fundamental periodic regulators are extrinsic to the animal; it is thus permissible for present purposes to consider any expression of variation in timing as dependent on environmental oscillators. It is not hereby meant to ignore the fact that differential responses to dominant environmental variables occur within a species, indicating endogenous control over timing of breeding. The work by Miller (1960:518) with three populations of the White-crowned Sparrow, revealing innately different responses to vernal photoperiodic increase, is especially important in this regard. For the moment, however, we may consider exogenous controls only.

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Any exogenous control, or environmental variable, can be looked on simply as a timing oscillator. Such variables show regular or irregular periodic activity, and the independent actions as a whole result in the more-or-less variable annual schedule of breeding for any species at any one place. It would seem that some oscillators are linked to one another, but there is a real question concerning the over-all degree to which linkage is present. It is significant that frequency distributions of breeding activity of various species and groups of birds take on the shape of a skewed normal curve. The more information is added to such distributions, the more nearly they approach being wholly normal, with irregularities tending to disappear. This kind of response itself is evidence that most of the variables influencing the distribution are not mutually linked.

This conclusion is warranted if we examine what would happen to frequency distributions if the variables or oscillators regulating timing were linked. The frequency distribution of breeding activity in birds is described by a nonlinear curve (a normal distribution is nonlinear). Let us assume that each of the environmental variables is a nonlinear oscillator, as is probable. A set of nonlinear oscillators mutually entrained or coupled and operating with reference to a given phenomenon would result in that phenomenon being described by a frequency distribution much more stable than if it were regulated by any one oscillator alone. However, the frequency distribution of a set of coupled nonlinear oscillators is non-normal (Wiener, 1958).

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We do not obtain such distributions in describing breeding activity, so we may say that the oscillators regulating such activity are not coupled. Present distribution, habitat preference, residency status, foraging adaptation, previous zoogeographic history, and relicts of ancestral adaptation, all bear on the character of the breeding schedule of any bird species. The emphasis above on multiple regulation of breeding schedules conceivably reflects the true picture, but any such emphasis is made at the expense of taking one factor as basic, or reducing the many to one, in order to manufacture simplicity.

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ACCOUNTS OF SPECIES

In each account below information is given concerning status, habitat, geographic distribution, seasonal occurrence, schedule of egg-laying, number of eggs laid, and sites of nests, as these pertain to Kansas, unless otherwise stated. The ways in which some of these points were elucidated are as follows.

1.—Breeding schedule. Frequency distributions of egg-laying in time are calculated on the basis of dates of completed clutches, as described earlier (p. 588). Any event in the series of actions of nesting—nestbuilding, egg-laying, incubation, brooding, feeding young out of nests—can be manipulated by adding or subtracting days to or from the date of record to yield the probable date of completion of the clutch. The resulting data are grouped into class intervals of ten days. Extreme dates here given for egg-laying may be as much as nine days off in accuracy, but the error does not often exceed five days. Extreme dates indicated here may be taken as actual or predicted extremes. The raw data used are on file at the Museum of Natural History and are available for use by any qualified individual.

2.—Dates of occurrence. First and last annual occurrences in the State for migrant species are indicated by both a range of dates and a median date. Twenty to 30 dates of first observation in spring are available for most of the common species, and 10 to 20 dates of last observation in autumn are at hand for such species. The median dates, earlier than and subsequent to which an equal number of observations are available, are reliable indicators of the dates on which a species is likely to be seen first in the State in an average year.

3.—Clutch-size. Information on number of eggs is given for each species according to the mode, followed by the mean, the range, and the size of the sample.

4.—Distribution in Kansas. Information on distribution in the breeding season within the borders of Kansas is given in accounts below chiefly by reference to one or more counties of the State. Location of counties can be made by referring to Figure 10.

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Pied-billed Grebe: *Podilymbus podiceps podiceps* (Linnaeus).—This is a common but local summer resident, in and on ponds, marshes, streams, ditches, and lakes. The species can be seen in the State at any time, but usually arrives in the period March 1 to April 13 (the median is March 21), and departs southward in the period October 13 to November 18 (the median is October 24).

Breeding schedule.—Nineteen records of breeding span the period May 1 to June 30; the modal date for egg-laying is May 15.

Number of eggs.—Clutch-size is 4 to 10 eggs.

Nests are floating masses of marsh vegetation (cattail, smartweed, duckweed, filamentous green algae, and the like), kept green on top by addition of fresh material, in or at the edge of emergent marsh vegetation.

Double-crested Cormorant: *Phalacrocorax auritus auritus* (Lesson).—This is a transient, but has been found nesting on one occasion in Barton County (Tordoff, 1956:311).

Breeding schedule.—Eggs were laid in July and August in the one known nesting effort.

Number of eggs.—Clutch-size is 2 to 4 eggs (Davie, 1898).

Great Blue Heron: *Ardea herodias* Linnaeus.—This common summer resident nests in tall trees along rivers, streams, and marshes. The sector of greatest abundance is the Flint Hills. *A. h. herodias* Linnaeus occurs in extreme northeastern Kansas, *A. h. wardi* Ridgway breeds in southeastern Kansas, and *A. h. treganzai* Court breeds in western Kansas; specimens showing intermediate morphology have been taken from the central part of the State. Occurrence in time, exclusive of the few that overwinter in Kansas, is shown in [Table 10](#).

Breeding schedule.—Seventy-seven records of breeding span the period March 1 to April 30 ([Fig. 3](#)); the modal date of egg-laying is April 5.

Number of eggs.—Clutch-size is 4 eggs (4.4, 3-6; 36).

Nests are placed in crotches of sycamore, cottonwood, elm, hackberry, oak, and walnut, from 30 to 60 feet high; the average height is about 40 feet.

TABLE 10.—OCCURRENCE IN TIME OF SUMMER RESIDENT HERONS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Great Blue Heron	Feb. 4-Apr. 8	Mar. 20	Oct. 10-Nov. 29	Oct. 23
Green Heron	Mar. 29-May 4	Apr. 27	Sept. 1-Oct. 30	Sept. 9
Common Egret	Apr. 8-May 12	Apr. 2	Sept. 4-Sept. 30	Sept. 21
Black-crowned Night Heron	Mar. 27-May 18	Apr. 25	Sept. 10-Nov. 11	Sept. 25
Yellow-crowned Night Heron	Apr. 15-May 18	Apr. 27	.....	.....
American Bittern	Apr. 4-May 9	May 1	Oct. 6-Dec. 12	Oct. 16
Least Bittern	Apr. 9-May 22	Apr. 8	Oct. 24	.....

Green Heron: *Butorides virescens virescens* (Linnaeus).—This is a common summer resident about streams, lakes, and marshes throughout the State. Some characteristics of the temporal occurrence of this species are indicated in [Table 10](#).

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Breeding schedule.—Twenty-eight records of breeding span the period April 21 to June 20 ([Fig. 3](#)); the modal date of completion of clutches is May 5.

Number of eggs.—Clutch-size is 3 eggs (3.1, 3-5; 17).

Nests are placed about 10 feet high (two to 35 feet) in willow, cottonwood, elm, and the like.

Little Blue Heron: *Florida caerulea caerulea* (Linnaeus).—This is chiefly a postbreeding summer visitant, but there is one record of breeding in Finney County (Tordoff, 1956:312).

Breeding schedule.—There is no information on breeding schedule in Kansas or in adjacent areas.

Number of eggs.—Clutch-size is 2 to 4 eggs (Davie, 1898).

Nests are placed in trees and bushes at various heights above the ground.

Common Egret: *Casmerodius albus egretta* (Gmelin).—This is a postbreeding summer visitant, but has been found nesting once in Cowley County (Johnston, 1960:10). Occurrence in time is listed in [Table 10](#).

Breeding schedule.—There is no information on breeding schedule in Kansas.

Number of eggs.—Clutch-size is 2 to 4 eggs (Davie, 1898).

Nests are placed in trees, usually above 20 feet in height; the one instance of nesting in the State was within a colony of Great Blue Herons.

Snowy Egret: *Leucophoyx thula thula* (Molina).—This postbreeding summer visitant has been found nesting once in Finney County (Tordoff, 1956:312).

Breeding schedule.—There is no information on breeding schedule in the State.

Number of eggs.—Clutch-size is 2 to 5 eggs (Davie, 1898).

Nests in Kansas are placed among those of Great Blue Herons.

Black-crowned Night Heron: *Nycticorax nycticorax hoactli* (Gmelin).—This is a locally common summer resident around marshes and riparian habitats. Characteristics of the occurrence of the species in time are given in [Table 10](#).

Breeding schedule.—Eggs are laid in the period May 1 to August 10.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed at medium elevations in riparian trees, in Kansas chiefly cottonwood, or in beds of emergent marsh vegetation.

Yellow-crowned Night Heron: *Nyctanassa violacea violacea* (Linnaeus).—This is a local summer resident in riparian habitats, chiefly in southeastern Kansas. Specimens taken in the breeding season and records of nesting come from Meade, Stafford, Doniphan, Douglas, Greenwood, Woodson, Labette, and Cherokee counties. Characteristics of occurrence in time in Kansas are shown in [Table 10](#). *Breeding schedule.*—Eggs are laid in May and June.

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Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed in riparian trees.

Least Bittern: *Ixobrychus exilis exilis* (Gmelin).—This is a local summer resident in marshland. Characteristics of its occurrence in time are indicated in [Table 10](#).

Breeding schedule.—Eleven records of breeding span the period May 21 to July 20; the modal date of egg-laying seems to be in the first week of June.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed in dense emergent vegetation a few inches to a foot above the surface of the water.

American Bittern: *Botaurus lentiginosus* (Rackett).—This is a local summer resident in marshes and heavy grassland. The species occurs temporally according to characteristics as listed in [Table 10](#).

Breeding schedule.—Eggs are laid in May and probably in June.

Number of eggs.—Clutch-size is 3 or 4 eggs.

Nests are placed on the ground in heavy cover.

White-faced Ibis: *Plegadis chihi* (Vieillot).—This is a local summer resident in marshland; actual records of breeding come only from Barton County (Nossaman, 1952:7; Zuvanich, 1963; M. Schwilling, personal communication, July, 1962). The species has been recorded in the State from April 17 to October 6.

Breeding schedule.—Twenty-five breeding records are for June and early July.

Number of eggs.—Clutch-size is about 4 eggs (3.9, 3-4; 24).

Nests are placed in emergent marsh vegetation near the surface of the water, in Barton County in extensive cattail beds harboring also Black-crowned Night Herons.

Mallard: *Anas platyrhynchos platyrhynchos* Linnaeus.—This is a local summer resident around marshes. The time of greatest abundance is October to April, but most birds move north for breeding.

Breeding schedule.—Fifteen records of breeding span the period April 1 to June 10; the modal date of egg-laying is in the first ten days of May.

Number of eggs.—Clutch-size varies widely; first clutches are of about 12 eggs. Brood sizes vary from 3 to 12 individuals in Kansas.

Nests are placed on the ground surface, in pasture grasses, marsh grasses, cattail, sedge, and smartweed.

Pintail: *Anas acuta* Linnaeus.—This is a local summer resident in marshland. The time of greatest abundance is from September to May, but most birds move north for breeding.

Breeding schedule.—Eleven records of breeding span the period April 21 to June 10; the peak of egg-laying seems to be in the period May 1 to 10.

Number of eggs.—Clutch-size is around 10 eggs. Brood sizes vary from 3 to 8 individuals in Kansas.

Nests are placed on the ground surface, in cover of marsh grass, cattail, or sedge.

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Blue-winged Teal: *Anas discors discors* Linnaeus.—This summer resident is locally common around marshes and ponds. The species arrives in spring in the period March 9 to April 5 (the median is March 23); birds are last seen sometime between October 7 and November 26 (the median is October 20).

Breeding schedule.—Twenty-two records of breeding span the period May 1 to May 30; the peak of egg-laying is around May 15. It is doubtful that the present data indicate the full extent of the egg-season in this duck.

Number of eggs.—Clutch-size is 8 to 12 eggs.

Nests are placed on the ground surface, in cover of grasses, cattail and sedges.

Shoveler: *Anas clypeata* Linnaeus.—This is an irregular and local summer resident, around marshes. Most individuals seen in the State are passage migrants. Breeding records are from Barton and Finney counties.

Breeding schedule.—Seasonal limits are unknown for the Shoveler in Kansas.

Number of eggs.—Clutch-size is about 8 eggs (Davie, 1898).

Nests are placed on the ground surface in cover of marsh vegetation.

Wood Duck: *Aix sponsa* (Linnaeus).—This is an uncommon summer resident around wooded streams and ponds in eastern Kansas. Nesting records and specimens taken in the breeding season come from east of stations in Pottawatomie, Coffey, and Woodson counties. Most nesting records at present come from the Marais des Cygnes Wildlife Refuge, Linn County. The species is present in the State from March 5 to December 8.

Breeding schedule.—Eleven records of breeding span the period March 21 to May 10; the peak of egg-laying is probably in mid-April. The present data are inadequate for showing the full span of the breeding season.

Number of eggs.—Clutch-size is around 15 eggs, varying from 10 to 23 in the sample at hand.

Nests are placed in crevices and hollows in trees near water, 10 to 70 feet high.

Redhead: *Aythya americana* (Eyton).—This duck nested at Cheyenne Bottoms, Barton County, 1962: 9 eggs found May 31 (M. Schwilling); also reported to have nested at Cheyenne Bottoms about 1928 (Tordoff, 1956:316).

Canvasback: *Aythya valisineria* (Wilson).—This duck nested at Cheyenne Bottoms, Barton County, 1962: 14 eggs found June 20 (M. Schwilling).

Ruddy Duck: *Oxyura jamaicensis rubida* (Wilson).—This is a local summer resident in marshland; numbers seem generally higher in western than in eastern Kansas. The season of greatest abundance is March through November, but numbers are conspicuously reduced in midsummer.

Breeding schedule.—Eggs are known to be laid in May and June.

Number of eggs.—Clutch-size is about 10 eggs (Davie, 1898).

Nests are placed near the edge of water, either in or on emergent marsh vegetation; nests of other marshland birds, such as coots, are sometimes appropriated (Davie, 1898).

Turkey Vulture: *Cathartes aura teter* Friedmann.—This summer resident is common throughout Kansas. Occurrence in time is indicated in [Table 11](#).

Breeding schedule.—Fifteen records of breeding span the period April 21 to June 10; earlier records will doubtless be found, to judge from the frequency distribution of the present sample. The peak of egg-laying is perhaps around May 1.

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Number of eggs.—Clutch-size is 2 eggs (1.8, 1-2; 12).

Nests are placed in holes and crevices in trees and cliffs, on rocky ledges, and the like.

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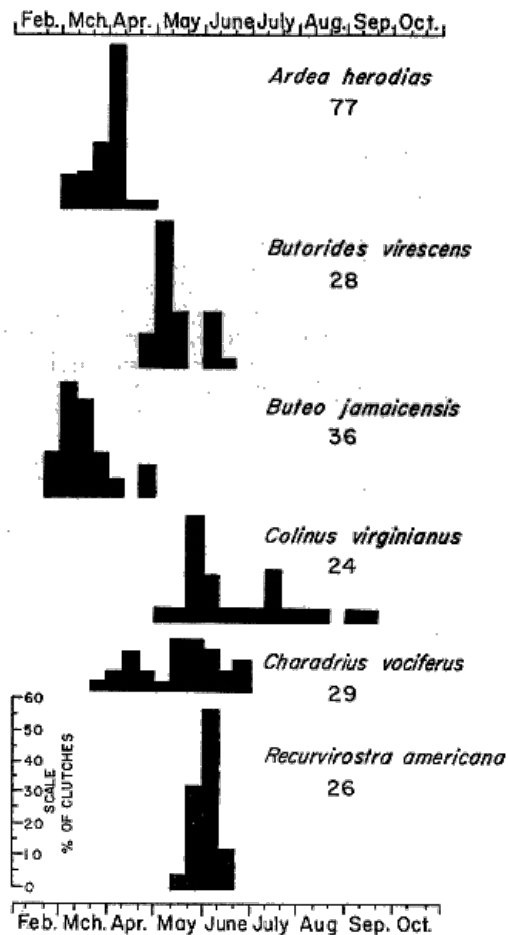


FIG. 3.—Histograms representing breeding schedules of two herons, the Red-tailed Hawk, Bobwhite, and two shore birds in Kansas. See legend to Figure 1 for explanation of histograms.

Black Vulture: *Coragyps atratus* (Meyer).—This is possibly a summer resident in the southeastern sector of Kansas. There is one nesting record, for Labette County (Goss, 1891:245).

Breeding schedule.—There are no data for this species in Kansas.

Number of eggs.—Clutch-size is 2 eggs (Davie, 1898).

Nests are placed in hollows (logs, stumps, *etc.*) on the ground surface.

Swallow-tailed Kite: *Elanoides forficatus forficatus* (Linnaeus).—This kite was formerly a summer resident in eastern Kansas; it no longer occurs as a breeding species.

Breeding schedule.—In Kansas the season seemed to occur relatively late in the year for a raptor; eggs were laid in May, so far as is known.

Number of eggs.—Clutch-size is about 2 eggs (Davie, 1898).

Nests are placed in tops of trees.

Mississippi Kite: *Ictinia mississippiensis* (Wilson).—This is a common summer resident in southern Kansas, west to Morton County. Specimens taken in the breeding season and records of nesting come from south of stations in Grant, Barton, Harvey, and Douglas counties; the present center of abundance is in Meade, Clark, Comanche, Barber, and Harper counties.

Breeding schedule.—Seven records of breeding span the period April 20 to June 10; the peak of egg-laying seems to be in the first week of May.

Number of eggs.—Clutch-size is 2 eggs.

Nests are placed about 35 feet high (from 25 to 50 feet) in cottonwood, willow, elm, black locust, and the like.

Sharp-shinned Hawk: *Accipiter striatus velox* (Wilson).—This rare summer resident apparently occurs only in the eastern part. The two nesting records are from Cloud and Pottawatomie counties.

Breeding schedule.—The information at hand suggests the birds lay in April and May.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898).

Nests are placed 20 or more feet high in coniferous or deciduous trees.

Cooper Hawk: *Accipiter cooperii* (Bonaparte).—This is an uncommon resident. Specimens taken in the breeding season and actual records of nesting come from east of stations in Cloud, Anderson, and Montgomery counties.

Breeding schedule.—Fourteen records of breeding span the period March 21 to May 30; the modal date of egg-laying is April 25.

Number of eggs.—Clutch-size is 4 eggs (3.8, 2-5; 5).

Nests are placed from 15 to 30 feet high, averaging 25 feet in elm, oak, and other trees.

Red-tailed Hawk: *Buteo jamaicensis borealis* (Gmelin).—This is a common resident east of the 100th meridian; to the west numbers are reduced, although the species is by no means unusual in western Kansas. Red-tails probably always were uncommon in western Kansas; Wolfe (1961) reports that they were "very rare as a nesting species" in Decatur County shortly after the turn of the 20th Century. *Breeding schedule.*—Thirty-six records of breeding span the period February 21 to April 10 ([Fig. 3](#)); the modal date of egg-laying is March 5.

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Number of eggs.—Clutch-size is 3 eggs (2.6, 2-3; 20).

Nests are placed about 40 feet high, ranging from 15 to 70 feet in cottonwood, honey locust, osage orange, sycamore, and walnut.

Red-shouldered Hawk: *Buteo lineatus lineatus* (Gmelin).—This is an uncommon summer resident in eastern Kansas, in riparian and bottomland timber. Nesting records are available from Leavenworth, Woodson, and Linn counties, and red-shoulders probably also nest in Doniphan County (Linsdale, 1928).

Breeding season.—Eggs are laid in March and April.

Number of eggs.—Clutch-size is about 3 eggs (Davie, 1898).

Nests are placed up to 70 feet high in elms and other streamside trees.

TABLE 11.—OCCURRENCE IN TIME OF THE SUMMER RESIDENT VULTURE AND HAWKS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Turkey Vulture	Mar. 7-Mar. 30	Mar. 15	Sept. 24-Oct. 28	Oct. 5
Red-shouldered Hawk	Feb. 10-Mar. 14	Feb. 26	Oct.-Dec.	.....
Broad-winged Hawk	Apr. 4-Apr. 21	Apr. 12	Sept. 1-Oct. 20	.....
Swainson Hawk	Mar. 24-Apr. 28	Apr. 12	Oct. 5-Nov. 2	Oct. 11

Broad-winged Hawk: *Buteo platypterus platypterus* (Vieillot).—This is an uncommon summer resident in eastern Kansas, in swampy woodland. Specimens taken in the breeding season and nesting records are from Shawnee, Douglas, Leavenworth, and Johnson counties; there are several nesting records from Missouri in the bottomlands just across the river from Wyandotte County Kansas. Occurrence in time is listed in [Table 11](#).

Breeding schedule.—Four records of nesting span the period April 21 to May 30, but it is likely that the egg-season is longer than this.

Number of eggs.—Clutch-size is about 3 eggs.

Nests are placed high in deciduous trees.

Swainson Hawk: *Buteo swainsoni* Bonaparte.—This is a common summer resident in prairie grassland with open groves and scattered trees. Records of breeding are available from all parts of the State, but are least numerous from the southeastern quarter. Occurrence in time is listed in [Table 11](#).

Breeding schedule.—Sixteen records of breeding span the period April 11 to June 10; the modal date for completion of clutches is April 25.

Number of eggs.—Clutch-size is 2 eggs (2.4, 2-3; 5).

Nests are placed about 35 feet high, actually ranging from 12 to 75 feet, in cottonwood, elm, willow, and honey locust. Occasionally nests are placed on ledges in cliffs.

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Ferruginous Hawk: *Buteo regalis* (Gray).—This is an uncommon resident in western Kansas, in grassland with scattered trees. Records of nesting and specimens taken in the breeding season come from Wallace, Hamilton, Gove, Logan, and Finney counties.

Breeding schedule.—Five records of breeding span the period March 11 to April 30.

Number of eggs.—Clutch-size is about 3 eggs (3.3, 3-4; 4).

Nests are placed on the ground surface on small cliffs or promontories or low (six to 10 feet) in small trees such as osage orange, cottonwood, and mulberry.

Marsh Hawk: *Circus cyaneus hudsonius* (Linnaeus).—This is a local resident in grassland throughout Kansas. Most records of breeding come from east of the Flint Hills, but it is not certain that the few records from the west actually reflect a low density of Marsh Hawks in that area.

Breeding schedule.—Sixteen records of breeding span the period April 11 to May 20; the modal date for egg-laying is May 5.

Number of eggs.—Clutch-size is 5 eggs (5.2, 3-7; 14).

Nests are placed on the ground surface in grassy cover.

Peregrine Falcon: *Falco peregrinus anatum* Bonaparte.—This falcon nested, perhaps regularly but clearly in small numbers, in Kansas prior to the 20th Century. The best documented breeding occurrence was at Neosho Falls, Woodson County (Goss, 1891:283).

Breeding schedule.—Eggs were recorded as being laid in February and March.

Number of eggs.—Clutch-size is 3 or 4 eggs (Davie, 1898).

Nests are placed relatively high on cliffs and in trees; at Neosho Falls these birds used open cavities 50 to 60 feet high in sycamores.

Sparrow Hawk: *Falco sparverius sparverius* Linnaeus.—This is a common resident throughout Kansas, in parkland and woodland edge.

Breeding schedule.—Thirteen records of egg-laying span the period March 21 to May 20; the modal date of laying is not evident in this sample but it probably falls around April 10.

Number of eggs.—Clutch-size is 4 eggs (4.2, 3-5; 5).

Nests are placed in cavities about 16 feet high, actually 12 to 30 feet, in cottonwood, ash, maple, Purple Martin "houses," and human dwellings.

Greater Prairie Chicken: *Tympanuchus cupido pinnatus* (Brewster).—This is a locally common resident in eastern Kansas, in and about bluestem prairie grassland, and is local in the northwest in undisturbed plains grassland. Wolfe (1961) reports that the species was common in Decatur County shortly after the turn of the Century, but that it became rare by 1914.

Breeding schedule.—Twenty-one records of breeding span the period May 1 to June 10 (Fig. 3); the modal date for laying is May 5. The sample indicates an abrupt inception to laying of eggs, and this may be a reflection of timing characteristic of behavior at leks, or booming grounds.

Number of eggs.—Clutch-size is 12 eggs (11.7, 9-15; 17).

Nests are placed on the surface of the ground in bluestem grassland or plains bunchgrass, usually under cover of prairie grasses and forbs.

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Lesser Prairie Chicken: *Tympanuchus pallidicinctus* (Ridgway).—This is a local resident in sandy grassland in southwestern Kansas. Distribution is to the west and south of Pawnee County.

Breeding schedule.—There is no information on timing of the breeding season in Kansas.

Number of eggs.—Clutch-size is thought to be near that of the Greater Prairie Chicken. Vic Housholder (MS) observed a hen with ten chicks ten miles south of Dodge City, Ford County, on June 1, 1955.

Bobwhite: *Colinus virginianus* (Linnaeus).—This is a common resident in the east, but is local in western Kansas; occurrence is in broken woodland and other edge habitats. *C. v. virginianus* (Linnaeus) is found northeast of stations in Nemaha, Douglas, and Miami counties, and *C. v. taylori* Lincoln is found in the remainder of the State.

Breeding schedule.—Twenty-four records of breeding span the period May 1 to September 20 (Fig. 3); the modal date for first clutches is May 25. The long period of egg-laying after May probably includes both renesting efforts and true second nestings.

Number of eggs.—Clutch-size is about 13 eggs (12.8, 8-21; 22); in the present sample 16 eggs was the most frequent number.

Nests are placed on the surface of the ground at bases of bunch grasses, saplings, trees, or posts, under cover of prairie grasses, forbs, or small woody plants.

Scaled Quail: *Callipepla squamata pallida* Brewster.—This is a locally common resident in southwestern Kansas, chiefly west of Clark County and south of the Arkansas River; preferred

habitat seems to be in open, sandy prairie.

Breeding schedule.—Eggs are laid at least in May; the egg-season in Kansas is unlikely to be so prolonged as that of the Bobwhite; among other factors involved, the Scaled Quail in Kansas is at a northern extreme of its distribution, where suboptimal environmental conditions may occur relatively frequently.

Number of eggs.—Clutch-size is around 10 to 12 eggs.

Nests are placed on the ground surface under woody or herbaceous cover.

Ring-necked Pheasant: *Phasianus colchicus* Linnaeus.—This introduced resident is common in western Kansas, is local and uncommon in the east, and is found in agricultural land with scattered woody vegetation.

Breeding schedule.—Eggs are laid at least in May.

Number of eggs.—Clutch-size is 10 to 12 eggs.

Nests are placed on the surface of the ground in woody or herbaceous cover.

Wild Turkey: *Meleagris gallopavo* Linnaeus.—Turkeys formerly occurred as common residents in flood-plain woodland in eastern Kansas, and their distribution extended through the west in riparian woodland. Present population in eastern and southern sectors are partly the result of introductions of birds from Missouri by humans in the 1950s. Turkeys in southern Kansas are also present owing to natural dispersal along the Arkansas and Medicine Lodge rivers of birds native to and introduced into Oklahoma. No specimens of turkeys presently found in Kansas are available for examination but these birds probably are referable to *M. g. silvestris* Vieillot, the trinomen applied to turkeys in Missouri and northeastern Oklahoma.

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Turkeys from southern Texas recently have been liberated at several localities in southern Nebraska; turkeys seen in extreme northern Kansas are thus probably of these stocks. The name *M. g. intermedia* Sennett is applicable to these birds.

Breeding schedule.—No information is available on the egg-season in Kansas; turkeys have nested in southern Kansas within recent years, however.

Number of eggs.—Clutch-size is perhaps 12 eggs.

Nests are placed on the surface of the ground, usually well-concealed under woody vegetation.

King Rail: *Rallus elegans elegans* Audubon.—This summer resident is locally common in marshlands. Nesting records or adults taken in the breeding season are from Cheyenne, Meade, Pratt, Stafford, Cloud, Riley, Douglas, Anderson, and Allen counties. Dates of arrival in spring are recorded from April 7 to April 28; the median date is April 18. Departure in autumn is possibly as early as September in the north, but four records are in the period October 12 to November 25. The species occasionally can be found in winter (Douglas County, December 28, 1915).

Breeding schedule.—Fourteen records of breeding span the period May 1 to July 20; the modal date for egg-laying is June 5.

Number of eggs.—Clutch-size is about 10 eggs (9 to 12; 4 records).

Nests are placed on the surface of the ground, under grassy or woody cover.

Virginia Rail: *Rallus limicola limicola* Vieillot.—This is an uncommon summer resident, presumably throughout the State. The one breeding record is from Morton County (May 24, 1950; Graber and Graber, 1951). Dates of spring arrival are from April 19 to May 18; dates of last observation in autumn are within the period September 1 to October 30. A few birds overwinter in the southern part of the State (Meade County, December and January).

Breeding season.—Eggs are laid probably in May and June.

Number of eggs.—Six to 12 eggs are laid (Davie, 1898).

Nests are placed in emergent aquatic plants, near the surface of the water.

Sora: *Porzana carolina* (Linnaeus).—This is an uncommon summer resident in marshland. Nesting records or specimens taken in the breeding season come from Finney, Barton, Jefferson, Douglas, and Miami counties. First dates of observation in spring are from April 11 to May 9 (the median is May 1); dates when last observed in autumn are from September 30 to November 9 (the median is October 18).

Breeding schedule.—The one dated record comes from August.

Number of eggs.—Clutch-size is around 10 eggs (Davie, 1898).

Nests are on the ground in grassy or herbaceous cover.

Black Rail: *Laterallus jamaicensis jamaicensis* (Gmelin).—This is an uncommon summer resident in Kansas. Records of breeding and specimens taken in the breeding season come from Finney, Meade, Riley, and Franklin counties. Seasonal occurrence is within the period March 18 to September 26.

Breeding schedule.—Eggs are laid at least in June.

Number of eggs.—Clutch-size is about 8 eggs (6-10; 4). Nests are on the ground under cover of marsh plants.

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Common Gallinule: *Gallinula chloropus cachinnans* Bangs.—This is a local summer resident in marshlands. Nesting records and specimens taken in the breeding season come from Barton, Stafford, Shawnee, Douglas, and Coffey counties. Occurrence in the State is from April through September.

Breeding schedule.—Eggs are laid in May and June.

Number of eggs.—Clutch-size is about 10 eggs.

Nests are in marsh grasses and other emergent vegetation, not necessarily over water.

American Coot: *Fulica americana americana* Gmelin.—This is an uncommon, local summer resident in wetlands in Kansas. Coots are at greatest abundance in autumnal and spring migratory movements, but are present all year. Nesting has been recorded from Barton, Stafford, Doniphan, and Douglas counties.

Breeding schedule.—Thirty-eight records of breeding span the period May 11 to June 30; the mode to laying is May 25. Earlier breeding probably occurs in the State.

Number of eggs.—Clutch-size is 8 eggs (7.7, 5-12; 28).

Nests are made of marsh vegetation (arrowhead, cattail) and float on water.

Snowy Plover: *Charadrius alexandrinus tenuirostris* (Lawrence).—This summer resident is fairly common on the saline flats of central and south-central Kansas. Breeding records are from Barton, Stafford, Meade, Clark, and Comanche counties.

Breeding schedule.—Fifteen records show that eggs are laid in the period May 25 to June 20; the peak of laying seems to be around June 10.

Number of eggs.—Clutch-size is 3 eggs.

Eggs are deposited on bare sand.

Killdeer: *Charadrius vociferus vociferus* Linnaeus.—This summer resident is common throughout the State, in open country frequently near wetlands. A few individuals overwinter in Kansas, especially in the southern counties.

Breeding schedule.—The 29 records of breeding span the period March 21 to June 30; the modal date of laying is May 20. The distribution of completed clutches ([Fig. 3](#)) suggests that Killdeers are here double-brooded.

Number of eggs.—Clutch-size is 4 eggs.

Eggs are laid on the surface of the ground, frequently on gravel, field stubble, plowed earth, and pasture.

Mountain Plover: *Eupoda montana* (Townsend).—This is an uncommon and local summer resident in western short-grass prairie. Breeding records come from Greeley and Decatur counties.

Breeding schedule.—Wolfe (1961) wrote that the species in Decatur County laid eggs in the "last of May" in the early 1900s. The only other dated breeding record is of downy young (KU 5512, 5513) taken on June 21.

Number of eggs.—Clutch-size is usually 3 eggs.

Eggs are laid in slight depressions in the ground, "lined with a few grass stems," according to Wolfe (1961).

American Woodcock: *Philohela minor* (Gmelin).—This is a rare summer resident in wet woodlands in eastern Kansas. Arrival in the northeast is from mid-March through April, with departures southward occurring from September to December; the last date on which the species has been seen in any year is December 5. There are nesting records only from Woodson County; probably the species nests in Douglas County (Fitch, 1958:194).

Breeding schedule.—Eggs are laid in April.

Number of eggs.—Clutch-size is usually 4 eggs.

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Nests are depressions in the dry ground within swampy places, usually under heavy plant cover.

Long-billed Curlew: *Numenius americanus americanus* Bechstein.—This is an uncommon summer resident in western Kansas, in prairie grassland. Breeding records are from Stanton and Morton counties.

Breeding schedule.—Eggs are laid at least in May and June.

Number of eggs.—Clutch-size is 4 eggs.

Eggs are laid in slight depressions in the ground in grassy cover.

Upland Plover: *Bartramia longicauda* (Bechstein).—This is a locally common summer resident, most conspicuously in the Flint Hills, in grassland. Breeding records are from Trego, Hamilton, Finney, Morton, Meade, Marion, Chase, Kearny, Butler, Cowley, Douglas, Johnson, Wabaunsee, Franklin, Anderson, and Coffey counties. Dates of first arrival in spring span the period April 2 to May 5 (the median is April 19), and dates last seen in autumn are from September 3 to October 6 (the median is September 13).

Breeding schedule.—Sixteen records of breeding span the period April 21 to June 10; the modal date for egg-laying is May 5.

Number of eggs.—Usually 4 eggs are laid.

Eggs are placed on vegetation on the ground surface, in pasture, field stubble, or gravel, frequently under heavy plant cover.

Spotted Sandpiper: *Actitis macularia* (Linnaeus).—This summer resident is locally common on wet ground and along streams. Dates of arrival in spring are from March 29 to April 30 (the median is April 24), and dates of last observation in autumn span the period September 2 to October 10 (the median is September 18).

Breeding schedule.—Egg records are all from the northeastern sector, and all are for May.

Number of eggs.—Usually 4 eggs are laid.

Nests are of plant fibers in depressions in dry ground on gravel banks, pond or stream borders, or in pastureland.

American Avocet: *Recurvirostra americana* Gmelin.—This is a local summer resident in marshes in central and western Kansas. There are breeding records from Finney, Barton, and Stafford counties. Extreme dates within which avocets have been recorded are April 2 to November 21.

Breeding schedule.—Forty-one records of breeding span the period May 11 to June 20 (26 records shown in [Fig. 3](#)); the modal date for laying is June 5.

Number of eggs.—Usually 4 eggs are laid.

Nests are placed on the surface of the ground, near water.

Wilson Phalarope: *Steganopus tricolor* Vieillot.—This is a local summer resident in marshes in central and western Kansas, but breeding records are available only from Barton County. The earliest date of occurrence is April 7 and the latest is October 14.

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Breeding schedule.—Ten records indicate eggs are laid in May and June.

Number of eggs.—Three or 4 eggs are laid.

Nests are of plant stems in slight depressions in the ground.

Forster Tern: *Sterna forsteri* Nuttall.—This is a local summer resident in central Kansas, in marshes. There are breeding records only from Cheyenne Bottoms, Barton County (Zuvanich, 1963:1). First dates of arrival in spring span the period April 9 to 29 (the median is April 22), and apparent departure south in autumn occurs from August 1 to November 1 (the median is September 3).

Breeding schedule.—Twenty-three records of nesting are from late May to mid-June; all records are for the year 1962.

Number of eggs.—Usually 4 eggs are laid.

Nests are frequently floating platforms of vegetation (algae, cattail, and the like) in shallow water; old nests of Pied-billed Grebes are sometimes used as bases, and occasionally the birds nest on the ground.

Least Tern: *Sterna albifrons athalassos* Burleigh and Lowery.—This tern is a local summer resident in marshes and along streams in central and western Kansas. There are breeding

records from Hamilton, Meade, and Stafford counties. First dates of arrival in spring are from May 14 to 30 (the median is May 28), and last dates of occurrence in autumn are from August 9 to September 7 (the median is August 25).

Breeding schedule.—Twenty-one records of egg-laying are from May 21 to June 30 (Fig. 4); the modal date for laying is June 5.

Number of eggs.—Two, 3 or 4 eggs are laid.

Eggs are laid on the bare ground, usually a sandy surface, near water.

Black Tern: *Chlidonias niger surinamensis* (Gmelin).—This is a local summer resident in marshlands in central Kansas. There are breeding records only from Barton County for 1961 and 1962; possibly the species breeds in Douglas County. First dates of arrival in spring are from May 3 to 29 (the median is May 14), and last dates of occurrence in autumn are from September 2 to 30 (the median is September 11).

Breeding schedule.—Twenty-four sets of eggs (Parmelee, 1961:25; M. Schwilling) were complete between June 11 and July 12.

Number of eggs.—Clutch-size is 3 eggs.

Nests are of dead plant matter placed on floating parts of emergent green plants in shallow water.

Rock Dove: *Columba livia* Gmelin.—This species was introduced into North America by man from European stocks of semi-domesticated ancestry. "Pigeons" now are feral around towns and farms, and cliffsides in the west, and are locally common permanent residents throughout the State.

Breeding schedule.—Eggs are laid in every month of the year. The main season of breeding is spring, and this is depicted in Figure 4; the 26 records of breeding by feral birds are from January 11 to June 10, and the modal date of laying is probably April 5.

Number of eggs.—Pigeons usually lay 2 eggs. Nests are of sticks and other plant matter placed on ledges and recesses of buildings, bridges, and cliffs, 10 to 60 feet high.

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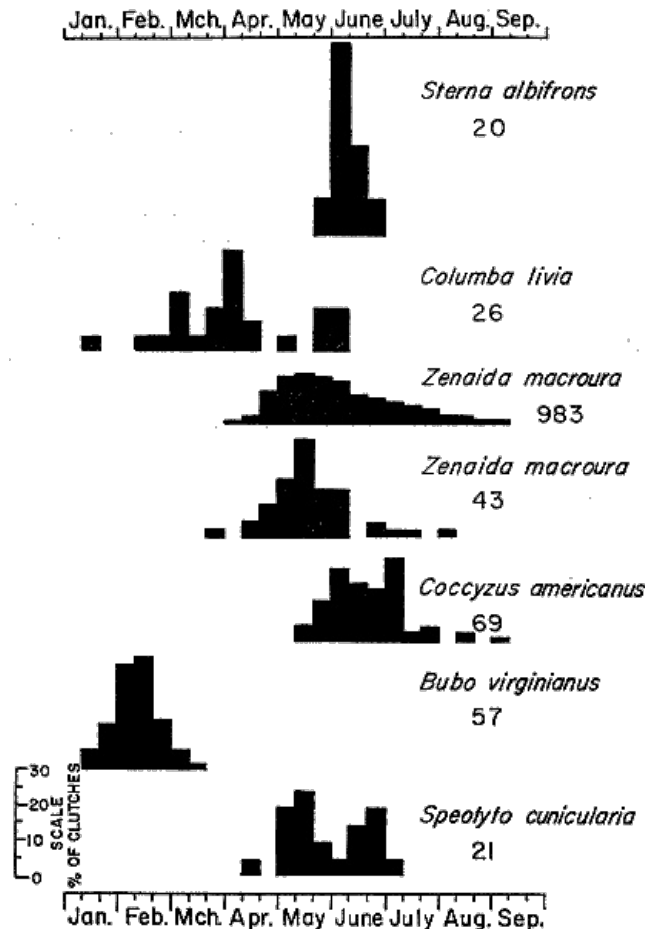


FIG. 4.—Histograms representing breeding schedules of the Least Tern, two doves, the Yellow-billed Cuckoo, and two owls in Kansas. See legend to Figure 1 for explanation of histograms.

Mourning Dove: *Zenaidura macroura marginella* (Woodhouse).—This is a common summer resident throughout the State, in open country and woodland edge. The species is also present in winter in much reduced numbers, and many are transient in periods of migration. The time of greatest abundance is from March to November. Doves of extreme eastern Kansas have by

some workers been referred to the subspecies *Z. m. carolinensis* (Linnaeus); specimens at the Museum of Natural History indicate that these doves are best regarded as members of populations of intermediate subspecific, or morphologic, affinities, and that they are satisfactorily included within *Z. m. marginella*.

Breeding schedule.—Numerous (983) records of egg-laying from north-central Kansas are from April 1 to September 10; the modal date for laying is May 15. Forty-three records of breeding from northeastern Kansas span the period March 21 to August 10; the modal date of laying is May 15. These samples are depicted in Figure 4.

Both sets of data are shown here to illustrate some of the differences between large and small samples of heterogeneous data. The small sample tends to be incomplete both early and late in the season, and the mode tends to be conspicuous. Yet, the modes for the two samples coincide. Also, the data from the north-central sector indicate that egg-laying in March would be found less than once in 983 records, but the small sample from the northeast includes one record for March. Such an instance doubtless reflects, at least in part, the fact that the two geographic sectors have different environmental conditions, but it is likely that the instance also partly reflects the unpredictable nature of sampling.

Number of eggs.—Doves lay two eggs. About one per cent of all nests have 3 eggs, but it is not known for any of these whether one or two females were responsible.

Nests are placed in a wide variety of plants, or on the ground. The commonest plants are those used most frequently; in north-central Kansas one-third of all nests are placed in osage orange trees, but in the northeast elms are most frequently used. Nestsites are from zero to 15 feet high.

Yellow-billed Cuckoo: *Coccyzus americanus americanus* (Linnaeus).—This is a common summer resident in riparian and second-growth habitats throughout the State. Twenty-three dates of first arrival in spring fall between April 29 and May 22 (the median is May 12), and nine dates of last observation in autumn run from September 13 to October 12 (the median is September 23).

Breeding schedule.—Sixty-nine records of egg-laying span the period May 11 to September 10 (Fig. 4); the modal date of laying is June 5.

Number of eggs.—Clutch-size is 3 eggs (3.1, 2-5; 54).

Nests are placed about six feet high (from four to 20 feet) in sumac, rose, pawpaw, mulberry, elm, cottonwood, willow, redbud, oak, osage orange, walnut, boxelder, usually on horizontal surfaces, and in heavy cover.

Black-billed Cuckoo: *Coccyzus erythrophthalmus* (Wilson).—This is an uncommon summer resident, occurring in heavy riparian shrubbery and second-growth. Breeding records are chiefly from eastern Kansas, but specimens have been taken in the breeding season in all parts of the State. Eleven dates of first arrival in spring are from May 7 to May 30 (the median is May 19), and four dates of last observed occurrence in autumn are between September 4 and October 7 (the average is September 18).

Breeding schedule.—Seventeen records of egg-laying are between May 21 and August 10; the mode is at June 5.

Number of eggs.—Clutch-size is 2 to 3 eggs (2.5, 2-3; 13).

Nests are placed about four feet high in heavy cover in plum, elm, locust, and the like.

Roadrunner: *Geococcyx californianus* (Lesson).—This is a local resident in southern Kansas in xeric scrub or open edge habitats. Breeding records are from Cowley and Sumner counties.

Breeding schedule.—Eggs are laid at least from early April to mid-July.

Number of eggs.—Clutch-size is about 5 eggs (4.5, 3-6; 4).

Nests are placed on the ground under plant cover, or occasionally low in bushes.

Barn Owl: *Tyto alba pratincola* Bonaparte.—This resident has a low density throughout Kansas in open woodland and near agricultural enterprises of man.

Breeding schedule.—The few records available indicate egg-laying occurs at least from April to July; elsewhere the species is known to have a more protracted breeding schedule.

Number of eggs.—Clutch-size is about 5 eggs (4.7, 2-6; 4).

Nests are informal aggregations of sticks and litter placed in recesses in stumps, hollow trees, rocky and earthen banks, and dwellings and outbuildings of man.

Screech Owl: *Otus asio* (Linnaeus).—This is a common resident in woodland habitats throughout Kansas. *O. a. aikenii* (Brewster) occurs west of Rawlins, Gove, and Comanche counties, and *O. a. naevius* (Gmelin) occurs in the remainder of the State except for the eastern

south-central sector, occupied by *O. a. hasbroucki* Ridgway.

Breeding schedule.—Fifteen records of egg-laying span the period March 20 to May 10; there is a strong mode at April 5.

Number of eggs.—Clutch-size is 4 eggs (4.0, 3-6; 12).

Nests are placed in holes and recesses in trees, three to 20 feet high.

Great Horned Owl: *Bubo virginianus* (Gmelin).—This is a common resident throughout Kansas, especially near woodlands and cliffsides. *B. v. virginianus* (Gmelin) occurs east of a line through Rawlins and Meade counties and *B. v. occidentalis* Stone occurs to the west.

Breeding schedule.—Fifty-seven records of egg-laying span the period January 11 to March 20 (Fig. 4); the modal date for laying is near February 10.

Number of eggs.—Clutch-size is 2 eggs (2.4, 2-3; 22).

Nests are placed about 30 feet high in cottonwood, elm, osage orange, hackberry, juniper, locust, cliffsides, and buildings of man. Old nests of hawks, crows, and herons are frequently appropriated.

Burrowing Owl: *Speotyto cunicularia hypugaea* (Bonaparte).—This is an uncommon summer resident in western Kansas in grassland and open scrub habitats. Stations of breeding all come from west of a line running through Cloud and Barber counties. Arrival in spring is between March 22 and April 17 (the median for 7 records is April 9), and dates last seen in autumn span the period September 8 to November 14 (the median for 9 records is September 26).

Breeding schedule.—Twenty-one records of egg-laying run from April 11 to July 10 (Fig. 4); the mode of laying is May 15.

Number of eggs.—Clutch-size is 7 or 8 eggs.

Nests are informal aggregations of plant and animal fibers in chambers of earthen burrows usually made by badgers or prairie dogs.

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Barred Owl: *Strix varia varia* Barton.—This is a local resident in eastern Kansas, in heavy woodland. The species is said by implication (A. O. U. Check-list, 1957) to occur in western Kansas, but no good breeding records are available, all such records coming from and east of Morris County. Specimens from southeastern Kansas show morphologic intergradation with characters of *S. v. georgica* Latham.

Breeding schedule.—Three records of egg-laying are for the first half of March.

Number of eggs.—Clutch-size in our sample is 2 eggs.

Nests are situated in cavities in trees or in old hawk or crow nests.

Long-eared Owl: *Asio otus wilsonianus* (Lesson).—This owl is a local resident or summer resident in woodland with heavy cover throughout the State. Breeding records are available from Trego, Meade, Cloud, and Douglas counties.

Breeding schedule.—Four records of egg-laying are for the period March 11 to April 10.

Number of eggs.—Clutch-size is 5 or 6 eggs.

Nests are placed in hollows of trees, stumps, cliffsides, on the ground surface, or in old hawk, crow, or magpie nests (Davie, 1898).

Short-eared Owl: *Asio flammeus flammeus* (Pontoppidan).—This is a local resident or summer resident in open, marshy, and edge habitats; records of nesting come from Republic, Marshall, Woodson, and Bourbon counties.

Breeding schedule.—Eggs are laid at least in April.

Number of eggs.—Clutch-size is about 6 eggs (Davie, 1898).

Nests are simple structures of sticks and grasses, placed on the ground in grasses, frequently near cover of downed timber or bushes.

Saw-whet Owl: *Aegolius acadicus acadicus* (Gmelin).—This is a rare and local resident, in woodland. There is one breeding record (summer, 1951, Wyandotte County; Tordoff, 1956:331).

Chuck-will's-widow: *Caprimulgus carolinensis* Gmelin.—This is a locally common summer resident in woodland habitats in eastern Kansas. Stations of occurrence of actual breeding fall south of Wyandotte County and east of Shawnee, Greenwood, Stafford, and Sedgwick counties.

Breeding schedule.—Five records of breeding come between April 21 and May 31, with a

peak perhaps in the first third of May.

Number of eggs.—Clutch-size is 2 eggs.

Eggs are laid on heavy leaf-litter, usually under shrubby cover.

Whip-poor-will: *Caprimulgus vociferus vociferus* Wilson.—This is a local summer resident in woodland in eastern Kansas. Breeding records are available only from Doniphan, Leavenworth, and Douglas counties; there are sight records in summer from Shawnee County.

Breeding schedule.—Two records of breeding cover the period May 21 to June 20.

Number of eggs.—Clutch-size is 2 eggs.

Eggs are laid on heavy leaf-litter in shrubby cover.

Poor-will: *Phalaenoptilus nuttallii nuttallii* (Audubon).—This is a common summer resident in western Kansas, in xeric, scrubby woodland. Breeding records are chiefly from west of Riley County, but there is one from Franklin County; specimens taken in the breeding season are available from Doniphan, Douglas, Anderson, Woodson, and Greenwood counties.

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Breeding schedule.—Six records of egg-laying are from the period May 1 to June 20.

Number of eggs.—Clutch-size is 2 eggs.

Eggs are laid on the ground, with or without plant cover.

TABLE 12.—OCCURRENCE IN TIME OF SUMMER RESIDENT CAPRIMULGIDS AND APODIDS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Chuck-will's-widow	Apr. 20-May 1	Apr. 28	Oct.-Dec.	Oct. ?
Whip-poor-will	Apr. 6-Apr. 25	Apr. 17	Sept. 10-Oct. 11	Sept. 21
Poor-will	Apr. 12	.....	Sept. 20	.....
Common Nighthawk	Apr. 29-May 23	May 15	Sept. 13-Oct. 18	Sept. 23
Chimney Swift	Apr. 2-Apr. 30	Apr. 22	Sept. 18-Oct. 30	Oct. 4
Ruby-throated Hummingbird	Apr. 2-May 19	May 6	Sept. 3-Oct. 15	Sept. 10

Common Nighthawk: *Chordeiles minor* (Forster).—This is a common summer resident throughout Kansas. Temporal occurrence is indicated in [Table 11](#). Three subspecies reach their distributional limits in the State, *C. m. minor* (Forster) in northeastern Kansas, *C. m. chapmani* Coues in southeastern Kansas, and *C. m. howelli* Oberholser west of the Flint Hills.

Breeding schedule.—Twenty-two records of breeding span the period May 11 to June 30; the modal date for egg-laying is June 10 ([Fig. 5](#)).

Number of eggs.—Clutch-size is 2 eggs.

Eggs are laid on the ground in rocky or gravelly areas, on unpaved roads, or on flat, gravelled tops of buildings of man.

Chimney Swift: *Chaetura pelagica* (Linnaeus).—This is a common summer resident in eastern Kansas, around towns. Temporal occurrence in the State is indicated in [Table 12](#).

Breeding schedule.—Thirty-six records of breeding span the period May 11 to June 30; the modal date for egg-laying is May 25 ([Fig. 5](#)).

Number of eggs.—Clutch-size is about 4 eggs.

Nests are secured by means of a salivary cement to vertical surfaces, usually near the inside tops of chimneys in dwellings of man, but occasionally in abandoned buildings and hollow trees.

Ruby-throated Hummingbird: *Archilochus colubris* (Linnaeus).—This is an uncommon summer resident in eastern Kansas, and is rare in the west, in towns and along riparian vegetation. Temporal occurrence in the State is listed in [Table 12](#).

Breeding schedule.—Eight records of breeding fall within the period May 21 to July 10; there seems to be a peak to laying in the last third of June.

Number of eggs.—Clutch-size is 2 eggs.

Most nests are on outer branches of shrubs and trees, in forks or on pendant branches, 10 to 20 feet high.

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Belted Kingfisher: *Megaceryle alcyon alcyon* (Linnaeus).—This summer resident is common throughout the State in streamside and lakeside habitats. Timing of arrival and departure of the breeding birds is not well-documented owing to the fact that the species is also

transient and a winter resident in the State.

Breeding schedule.—Eggs are laid at least from April 21 to May 20.

Number of eggs.—Clutch-size is near 6 eggs.

Eggs are laid on the floor of the chamber at the inner end of a horizontal tunnel excavated in an earthen bank. The tunnel is two to six feet long and many tunnels are strewn with bones and other dietary refuse.

Yellow-shafted Flicker: *Colaptes auratus* (Linnaeus).—This is a common resident and summer resident in eastern Kansas, meeting, hybridizing with, and partly replaced by *Colaptes cafer* westward, in open woodlands. *C. a. auratus* (Linnaeus) occurs in southeastern Kansas, and *C. a. luteus* Bangs occurs in the remainder, intergrading west of the Flint Hills with *C. cafer*.

Breeding season.—Forty-eight records of breeding span the period April 11 to June 10; the modal date for egg-laying is May 10 (Fig. 5). This sample is drawn from central and eastern Kansas, but includes records of breeding by some birds identified in the field as *C. cafer*.

Number of eggs.—Clutch-size is about 6 eggs.

Nests are piles of wood chips in cavities excavated in stumps and dead limbs of trees such as willow, cottonwood, mulberry, and catalpa, ordinarily about six feet above the ground.

Red-shafted Flicker: *Colaptes cafer collaris* Vigors.—This woodpecker is a common summer resident in western Kansas, meeting, hybridizing with, and largely replaced by *C. auratus* in central and eastern sectors. The vast majority of specimens taken in Kansas show evidence of intergradation with *C. auratus*.

Breeding schedule.—The few records of flickers identified in the field as *C. cafer* have been combined with those of *C. auratus* (Fig. 5).

Number of eggs.—Clutch-size is perhaps 6 eggs.

Nests are like those of *C. auratus*.

Pileated Woodpecker: *Dryocopus pileatus* (Linnaeus).—This is a rare and local resident in the east, in heavy timber. The species has been seen, chiefly in winter, in all sectors of eastern Kansas in recent years, but actual records of breeding come only from Linn and Cherokee counties. *D. p. abieticola* (Bangs) occurs in the northeast, and *D. p. pileatus* (Linnaeus) in the southeast.

Breeding schedule.—Eggs are laid at least in April.

Number of eggs.—Clutch-size is 3 or 4 eggs.

Nests are of wood chips in cavities excavated 45 to 60 feet high in main trunks of cottonwood, sycamore, and pin oak.

Red-bellied Woodpecker: *Centurus carolinus zebra* (Boddaert).—In woodland habitats this is a common resident in eastern Kansas, local in the west.

Breeding schedule.—Thirty-seven records of breeding span the period March 1 to June 30 (Fig. 5); the modal date of egg-laying is around April 25.

Number of eggs.—Clutch-size is about 5 eggs.

Nests are of wood chips in cavities excavated in elm, cottonwood, box elder, ash, hickory, or willow, about 25 feet high (nine to 60 feet).

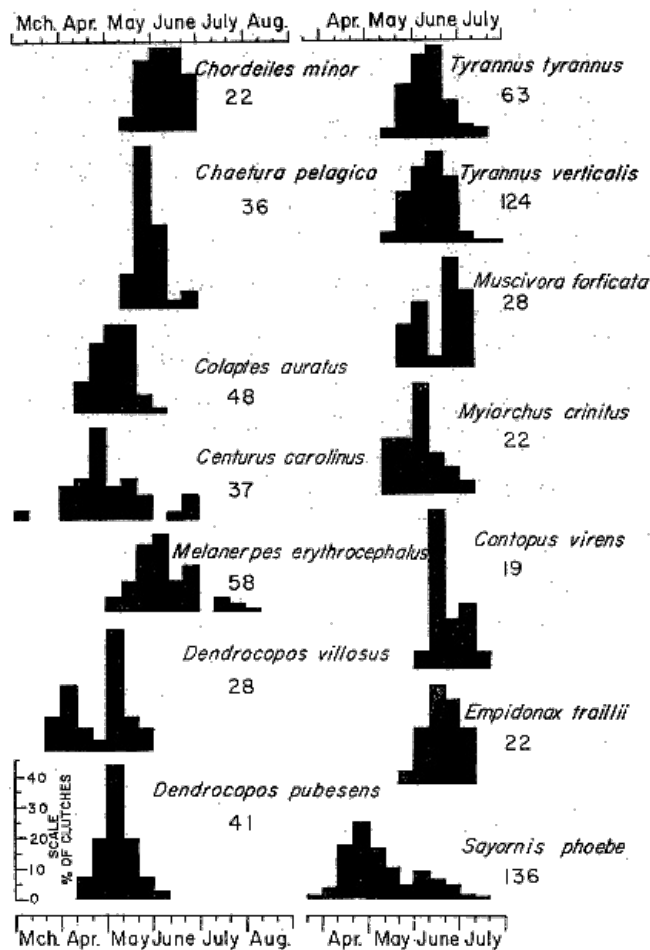


FIG. 5.—Histograms representing breeding schedules of the Common Nighthawk, Chimney Swift, woodpeckers, and flycatchers in Kansas. See legend to Figure 1 for explanation of histograms.

Red-headed Woodpecker: *Melanerpes erythrocephalus* (Linnaeus).—This is a common summer resident and uncommon permanent resident in open woodland; in winter it is noted especially around groves of oaks. *M. e. erythrocephalus* (Linnaeus) occurs in eastern Kansas and *M. e. caurinus* Brodtkorb occurs in central and western Kansas.

Breeding schedule.—Fifty-eight records of breeding span the period May 1 to August 10 (Fig. 5); the modal date of egg-laying is June 5.

Number of eggs.—Clutch-size is 3 or 4 eggs.

Nests are of wood chips in cavities excavated about 25 feet high in willow, cottonwood, and elm.

Hairy Woodpecker: *Dendrocopos villosus villosus* (Linnaeus).—This resident is common in woodlands throughout the State.

Breeding schedule.—Twenty-eight records of breeding span the period March 21 to May 30 (Fig. 5); the modal date of egg-laying is May 5.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are of wood chips in cavities excavated about 13 feet high in elm, honey locust, and ash.

Downy Woodpecker: *Dendrocopos pubescens* (Linnaeus).—This resident is common in woodland throughout the State. *D. p. pubescens* (Linnaeus) occurs in southeastern Kansas, and *D. p. medianus* (Swainson) in the remainder.

Breeding schedule.—Forty-one records of breeding span the period April 11 to June 10 (Fig. 5); the modal date of egg-laying is May 5.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are of wood chips in cavities excavated about 20 feet high in willow, honey locust, ash, apple, and pear.

Eastern Kingbird: *Tyrannus tyrannus* (Linnaeus).—This summer resident is common throughout the east; it is local in the west but there maintains conspicuous numbers in favorable places, such as riparian woodland; preferred habitat in eastern sectors is typically in woodland edge. Temporal occurrence is indicated in Table 13.

Breeding season.—Sixty-three dates of egg-laying span the period May 11 to July 20 ([Fig. 5](#)); the modal date for completion of clutches is June 15. Nearly 70 per cent of all eggs are laid in June.

Number of eggs.—Clutch-size is 3 eggs (3.3, 2-3; 10). Clutches are probably larger than the average in May and smaller in June and July.

Nests are placed in crotches, terminal forks, and some on tops of limbs, about 16 feet high, in elm, sycamore, honey locust, willow, oak, apple, and red cedar.

Western Kingbird: *Tyrannus verticalis* Say.—This summer resident is common in the west, but is local and less abundant in the east. Preferred habitat is in woodland edge, open country with scattered trees, and in towns. Temporal occurrence is indicated in [Table 13](#). *Breeding schedule.*—The 124 dates of egg-laying span the period May 11 to July 31 ([Fig. 5](#)); the modal date for egg-laying is June 15. More than 70 per cent of all clutches are laid in June.

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Number of eggs.—Clutch-size is 4 eggs (3.6, 3-4; 8).

Nests are placed in crotches, lateral forks, or on horizontal limbs, about 26 feet high, in cottonwood, elm, osage orange, hackberry, honey locust, mulberry, oak, and on power poles.

Scissor-tailed Flycatcher: *Muscivora forficata* (Gmelin).—This summer resident is common in central and southern Kansas; it is rare to absent in the northwestern sector, and is local in the northeast. Preferred habitat is in open country with scattered trees. Temporal occurrence is indicated in [Table 13](#).

Breeding schedule.—Twenty-eight records of breeding occur from May 21 to July 10 ([Fig. 5](#)); the modal date of egg-laying is June 25. The present sample of records is small, and there is otherwise no evidence suggesting that the breeding schedule of this species differs from those of the other two kingbirds in Kansas.

Number of eggs.—Clutch-size is 3 eggs (3.2, 2-5; 17). Mean clutch-size for the first peak of laying shown in Figure 5 is 4.0 eggs; that for the second peak is 2.7 eggs.

Nests are placed in forks or on horizontal limbs of osage orange, red haw, elm, and on crosspieces of power poles, about 15 feet high (ranging from five to 35 feet).

TABLE 13.—OCCURRENCE IN TIME OF SUMMER RESIDENT FLYCATCHERS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Eastern Kingbird	Apr. 22-Apr. 30	Apr. 28	Sept. 1-Sept. 24	Sept. 13
Western Kingbird	Apr. 23-Apr. 30	Apr. 28	Sept. 1-Sept. 26	Sept. 8
Scissor-tailed Flycatcher	Apr. 15-Apr. 28	Apr. 18	Sept. 21-Oct. 22	Oct. 12
Great Crested Flycatcher	Apr. 15-May 4	Apr. 29	Sept. 1-Sept. 21	Sept. 9
Eastern Phoebe	Mar. 3-Mar. 31	Mar. 22	Oct. 3-Oct. 27	Oct. 9
Say Phoebe	Apr. 4-Apr. 22	Apr. 12	.....	.....
Acadian Flycatcher	Apr. 30-May 19	May 9	Sept. 3-Sept. 17	Sept. 4
Eastern Wood Pewee	Apr. 2-May 28	May 19	Aug. 30-Sept. 18	Sept. 6

Great Crested Flycatcher: *Myiarchus crinitus boreus* Bangs.—This summer resident is common in eastern Kansas, but is less numerous in the west. Preferred habitat is in woodland and woodland edge. Temporal occurrence is indicated in [Table 13](#).

Breeding schedule.—The twenty-two records of egg-laying are in the period May 11 to July 10 ([Fig. 5](#)); the modal date for egg-laying is June 5. The shape of the histogram ([Fig. 5](#)) indicates that some breeding for which records are lacking occurs earlier in May.

Number of eggs.—Clutch-size is 5 eggs (4.8, 4-6; 6).

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Nests are placed in hollows and crevices in elm, maple, cottonwood, willow, pear, apple, oak, drain spouts, and, occasionally, "bird houses" made by man, about 17 feet high (four to 45 feet high).

Eastern Phoebe: *Sayornis phoebe* (Latham).—This summer resident is common in eastern Kansas, but is local in the west. Preferred habitat is in woodland edge and riparian groves, where most birds are found near bridges, culverts, or isolated outbuildings of man. Temporal occurrence is indicated in [Table 13](#).

Breeding schedule.—The 136 records of breeding span the period March 21 to July 20 ([Fig. 5](#)); the modal date for egg-laying is April 25 (for first clutches) and June 5 (for second clutches); this species seems to be the only double-brooded flycatcher in Kansas.

Number of eggs.—Clutch-size is 4 to 5 eggs (4.2, 3-5; 58). The seasonal progression in clutch-size can be summarized as follows:

March 21-April 10: 4.0 eggs (2 records)
April 11-May 10: 4.4 eggs (37 records)
May 11-June 10: 3.9 eggs (10 records)
June 11-July 20: 3.6 eggs (9 records)

Nests are placed on horizontal, vertical, or overhanging surfaces of culverts, bridges, houses of man, earthen cliffs, rocky ledges, and entrances to caves, at an average height of 7.8 feet.

Say Phoebe: *Sayornis saya saya* (Bonaparte).—This is a common summer resident in western Kansas, breeding at least east to Cloud County, in open country. Occurrence in time is listed in [Table 13](#).

Breeding schedule.—Ten records of breeding fall in the period May 1 to July 20; the modal date for egg-laying is in late May.

Number of eggs.—Clutch-size is about 5 eggs.

Nests are placed under bridges, in houses, or on cliffsides and earthen banks.

Acadian Flycatcher: *Empidonax virescens* (Vieillot).—This is an uncommon summer resident in eastern Kansas, in woodland and riparian habitats. Temporal occurrence is indicated in [Table 13](#).

Breeding schedule.—The available records of breeding by this species in Kansas are too few to indicate reliably the span of the breeding season. Information on hand suggests that Acadian Flycatchers lay most eggs in late May or early June, and this places their nesting peak some 10 to 20 days earlier than peaks for Wood Pewees and Traill Flycatchers.

Number of eggs.—Five records show 3 eggs each.

Nests are placed about six feet high on terminal twigs of oak and alder.

Traill Flycatcher: *Empidonax traillii traillii* (Audubon).—This flycatcher has only recently been found nesting within Kansas; the species is not included in analyses above. Twenty-three nesting records are here reported, for the species in Kansas City, Jackson and Platte counties, Missouri. Most of these records are from within a few hundred yards of the political boundary of Kansas. The Traill Flycatcher is a local summer resident in extreme northeastern Kansas (Doniphan County), in wet woodland and riparian groves. Temporal occurrence is not well-documented; first dates run from May 19 to 25; the last dates of annual occurrence, possibly not all for transients, run from August 14 to September 24.

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Breeding schedule.—Twenty-three records of breeding are from May 21 to July 10 ([Fig. 5](#)); the modal date for egg-laying is June 15.

Number of eggs.—Clutch-size is 3 eggs (3.4, 2-5; 22).

Nests are placed in forks, crotches, and occasionally near trunks, chiefly of willow, from 4.5 to 12 feet high (averaging six feet).

Eastern Wood Pewee: *Contopus virens* (Linnaeus).—This summer resident is common in the east, but is rare in the west. Preferred habitat is in edge of forest and woodland. Temporal occurrence is indicated in [Table 13](#).

Breeding schedule.—Nineteen dates of egg-laying span the period June 1 to July 20 ([Fig. 5](#)); the modal date for completion of clutches is June 15, and more than half of all clutches are laid in the period June 11 to 20.

Number of eggs.—Clutch-size is about 3 eggs.

Nests are placed on upper surfaces of horizontal limbs of oak, elm, and sycamore, about 22 feet high.

Horned Lark: *Eremophila alpestris* (Linnaeus).—Breeding populations are resident in open country with short or cropped vegetation. *E. a. praticola* (Henshaw) lives in the east, and *E. a. enthyia* (Oberholser) in the west.

Breeding schedule.—Twenty-one records of breeding span the period March 11 to June 10 ([Fig. 6](#)); the modal date for egg-laying is March 25. The histogram ([Fig. 6](#)) is constructed on a clearly inadequate sample, and records of breeding both earlier and later are to be expected. The peak of first nesting activity is probably reasonably well-indicated by the available records.

Number of eggs.—Clutch-size is 3 eggs (3.6, 3-5; 16).

Nests are placed on the ground, usually amid short vegetation such as cropped prairie grassland or cultivated fields (notably soybeans and wheat), and occasionally on bare ground.

TABLE 14.—OCCURRENCE IN TIME OF SUMMER RESIDENT SWALLOWS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Tree Swallow	Apr. 5-Apr. 30	Apr. 24	Sept. 30-Oct. 21	Oct. 8
Bank Swallow	Apr. 9-May 19	May 7	Sept. 3-Sept. 20	Sept. 10
Rough-winged Swallow	Mar. 29-May 30	Apr. 22	Sept. 23-Oct. 21	Oct. 10
Cliff Swallow	Apr. 14-May 27	May 11	Sept. 3-Oct. 25	Sept. 11
Barn Swallow	Mar. 31-Apr. 29	Apr. 21	Sept. 22-Oct. 25	Oct. 7
Purple Martin	Mar. 5-Apr. 9	Mar. 26	Aug. 28-Sept. 23	Sept. 3

Tree Swallow: *Iridoprocne bicolor* (Vieillot).—This is a summer resident in extreme northeastern Kansas; nesting birds have been found only along the Missouri River in Doniphan County. Habitat is in open woodland, and in Kansas is always associated with water. Temporal occurrence in the State is indicated in [Table 14](#).

Breeding schedule.—Eight records of breeding span the period May 21 to June 20; the modal date for egg-laying is May 25. The small sample may not accurately reflect the peak of nesting activity.

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Number of eggs.—Clutch-size is 5 or 6 eggs (5.5, 5-6; 4).

Nests are placed chiefly in abandoned woodpecker diggings in willows, four to ten feet high, over water.

Bank Swallow: *Riparia riparia riparia* (Linnaeus).—This summer resident is common wherever cut-banks suitable for nesting activities allow relatively undisturbed behavior. The species is almost always found near water. Temporal occurrence is indicated in [Table 14](#).

Breeding schedule.—Sixty records of breeding span the period May 11 to June 20 ([Fig. 6](#)); the modal date for completion of clutches is June 5.

Nearly 75 per cent of all clutches are laid in the period May 21 to June 10. Under unusual circumstances time of breeding can be greatly delayed; such circumstances occurred in 1961 in many places along the Kansas River in eastern Kansas, where the soft, sandy-clay banks were repeatedly washed away in May and June by high water undercutting the cliffs. Bank Swallows attempted to work on burrows in late May, but stabilization of the banks occurred only by late June, and the peak of egg-laying for many colonies was around July 12. Records for 1961 are omitted from the sample used here ([Fig. 6](#)).

Number of eggs.—Clutch-size is 5 eggs (4.8, 3-7; 60). Yearly clutch-size at one colony 3 miles east of Lawrence, Douglas County, is as follows:

1959: 5.2, 19 records
 1960: 5.0, 12 records
 1961: 3.7, 11 records
 1962: 4.8, 18 records

The sample for 1961 is that taken in early July when breeding occurred after a delay of more than a month, as described above.

Nesting chambers are excavated in sandy-clay banks, piles of sand, piles of sawdust, or similar sites, at ends of tunnels one to more than three feet in depth from the vertical face of the substrate.

Rough-winged Swallow: *Stelgidopteryx ruficollis serripennis* (Audubon).—This summer resident is common in most places; it is not restricted to a single habitat, but needs some sort of earthen or other substrate with ready-made burrows for nesting. Temporal occurrence is indicated in [Table 14](#).

Breeding schedule.—The 14 records of breeding are in the period May 11 to June 30; the modal date of egg-laying is June 5. Seventy per cent of all eggs are laid in the period May 21 to June 10.

Number of eggs.—Clutch-size is 5 eggs (5.0, 4-6; 4).

Nesting chambers are in old burrows of Bank Swallows, Kingfishers, rodents, or in crevices remaining subsequent to decomposition of roots of plants; frequently this swallow uses a side chamber off the main tunnel, near the mouth, of a burrow abandoned or still in use by the other species mentioned above.

Cliff Swallow: *Petrochelidon pyrrhonota pyrrhonota* (Vieillot).—This common summer resident occurs wherever suitable sites for nests are found. Temporal occurrence is indicated in [Table 14](#).

Breeding schedule.—The 610 records of breeding span the period May 21 to June 30 ([Fig. 6](#)); the modal date for egg-laying is June 5, and 85 per cent of all clutches are laid from May 21 to

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June 10. Such synchronous breeding activity is probably a function of strong coloniality with attendant "social facilitation" of breeding behavior.

Number of eggs.—Clutch-size is 5 eggs (4.9, 3-7; 7).

Nests are built in mud jugs plastered to vertical rock faces, bridges, culverts, and buildings from a few feet to more than 100 feet above the ground.

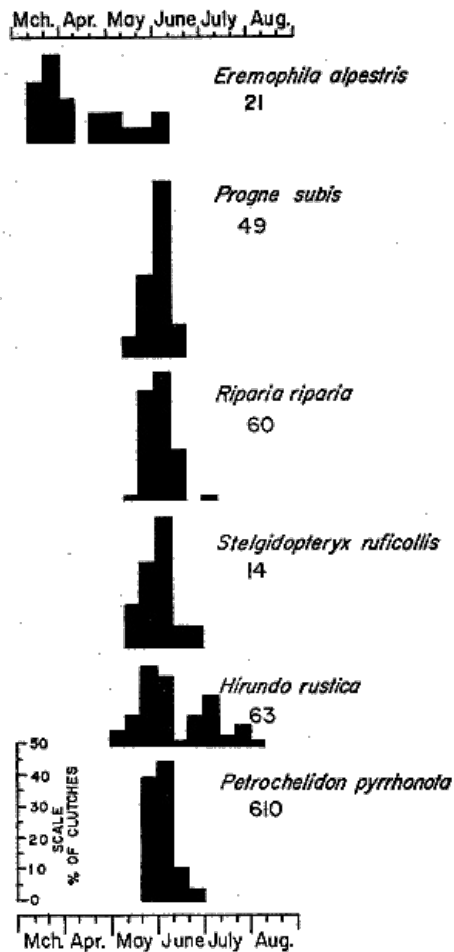


FIG. 6.—Histograms representing breeding schedules of the Horned Lark and swallows in Kansas. See legend to Figure 1 for explanation of histograms.

Barn Swallow: *Hirundo rustica erythrogaster* Boddaert.—This summer resident is common in most habitats, occurring chiefly about cultivated fields and pastures. Temporal occurrence is indicated in [Table 14](#).

Breeding schedule.—Sixty-three records of breeding in northern Kansas span the period May 1 to July 31 ([Fig. 6](#)); the modal date for completion of first clutches is May 25, and that for the second is July 5. The schedule of breeding in southern Kansas (chiefly Cowley County), to judge by 41 records, conforms to the one for northern Kansas: the season spans the period May 1 to August 10, and the modal date for first clutches is May 15. The ten-day lag in peak of first clutches of the northern over the southern sample is about what would be expected on the basis of differential inception of the biological growing season from south to north each spring.

Number of eggs.—Clutch-size does not vary geographically, to judge only from the present samples, and all are included in the listing to follow. The modal size of clutches is 5 eggs (4.7, 3-7; 43); clutches from the period May 1 to 30 show an average of 5.0 eggs, from June 1 to 20 an average of 4.9 eggs, and from June 21 to August 10, 4.4 eggs.

Nests are usually placed on horizontal surfaces in barns, sheds, or other such structures; more rarely they are put on bridges, and less frequently yet on vertical walls of culverts or sheds.

Purple Martin: *Progne subis subis* (Linnaeus).—This summer resident is common in the east but rare in the west. The only documented colony west of the 99th meridian was in Oberlin, Decatur County (Wolfe, 1961), occupied some 50 years ago. Temporal occurrence is indicated in [Table 14](#).

Breeding schedule.—The breeding season spans the period May 11 to June 20 ([Fig. 6](#)); the modal date of egg-laying is June 5, and 57 per cent of all clutches are laid in the period June 1 to 10.

Number of eggs.—Clutch-size is 5 eggs (4.2, 3-6; 33). Mean clutch-size is 4.3 eggs in May and 4.2 in June. Adults tend to lay clutches of 5 eggs and first-year birds clutches of 4.

Replacement clutches by birds of any age tend to be of 3 eggs.

Nests are built of sticks and mud placed in cavities; in Kansas these are almost always in colony houses erected by man. Use of holes and crevices in old buildings is known to have occurred on the campus of The University of Kansas in the nineteen thirties (W. S. Long, 1936, MS), in Oberlin, Decatur County in 1908-1914 (Wolfe, *loc. cit.*), and presently in Ottawa, Franklin County (Hardy, 1961).

Blue Jay: *Cyanocitta cristata bromia* Oberholser.—This resident is common throughout Kansas in woodland habitats. Most first-year birds move south in winter, but adults tend to be strictly permanent residents. Groups of ten to more than 50 individuals can be seen moving south in October and north in April. All individuals taken from such mobile groups are in first-year feather.

Breeding schedule.—Eighty-three records of breeding span the period April 10 to July 10 (Fig. 7); the modal date of egg-laying is May 15, and about 50 per cent of all clutches are laid in the period May 11-31.

Number of eggs.—Clutch-size is 4 eggs (4.1, 3-6; 15).

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Nests are placed from eight to 70 feet high (averaging 24 feet) in forks, crotches, and on horizontal limbs of elm, maple, osage orange, cottonwood, and ash.

Black-billed Magpie: *Pica pica hudsonia* (Sabine).—This resident is common in western Kansas, along riparian groves and woodland edge. Records of nesting are from as far east as Clay County. Wolfe (1961) outlines the history of magpies in Decatur County as follows: the species was purported to have appeared in rural districts near Oberlin in 1918, but Wolfe saw the birds only by 1921, at which time he also found the first (used) nests. The first reported occupied nest was one in Hamilton County in 1925 (Linsdale, 1926). Earlier records, chiefly of occurrence in winter, can be found in Goss (1891).

Breeding schedule.—Fourteen records of breeding span the period April 11 to June 20; the modal date for egg-laying is May 15.

Number of eggs.—There are no data on clutch-size in Kansas; elsewhere Black-billed Magpies lay 3 to 9 eggs, and clutches of 7 are found most frequently (Linsdale, 1937:104).

Nests are placed from 10 to 18 feet high (averaging 13 feet) in forks or lateral masses of branches in cottonwood, box elder, ash, and willow.

White-necked Raven: *Corvus cryptoleucus* Couch.—This summer resident is common in western Kansas, probably occupying locally favorable sites in prairie grassland and woodland edge west of a line from Smith to Seward counties. The species is known to nest in Cheyenne, Sherman, and Finney counties.

Breeding schedule.—There are few data from Kansas; Aldous (1942) states that the birds begin activities leading to building sometime in April in Oklahoma; the peak of egg-laying probably occurs in May, which coincides with the records from Kansas.

Number of eggs.—Outside Kansas, this species lays 3 to 7 eggs; these figures seem applicable to Kansas, where brood sizes are known to run from 1 to 7 young.

Nests are placed about 20 feet high in cottonwood and other trees.

Common Crow: *Corvus brachyrhynchos brachyrhynchos* Brehm.—This resident is common in most of Kansas, but numbers are lower in the west. Distribution in the breeding season is west at least to Cheyenne, Logan, and Meade counties.

Breeding schedule.—Sixty-nine records of breeding span the period March 10 to May 31 (Fig. 7); the modal date for egg-laying is April 5, and 60 per cent of all eggs are laid between March 21 and April 10.

Number of eggs.—Clutch-size is 4 eggs (4.2, 3-5; 19).

Nests are placed about 20 feet high in crotches near trunks or heavy branches of such trees as red cedar, elm, oak, osage orange, cottonwood, honey locust, box elder, and pine.

Black-capped Chickadee: *Parus atricapillus* Linnaeus.—This resident is common north of the southernmost tier of counties, in forested and wooded areas. *P. a. atricapillus* Linnaeus occurs chiefly east of the 98th meridian, and *P. a. septentrionalis* Harris occurs west of this; a broad zone of intergradation exists between these two subspecies. *Breeding schedule.*—Fifty-one records of breeding span the period March 21 to June 10 (Fig. 7); the modal date for laying is April 15, and 64 per cent of all eggs are laid between April 11 and 30.

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Number of eggs.—Clutch-size is 5 eggs (5.4, 4-7; 10).

Nests are placed in cavities about ten feet high (ranging from four to 20 feet) in willow, elm, cottonwood, honey locust, apricot, or nestboxes placed by man.

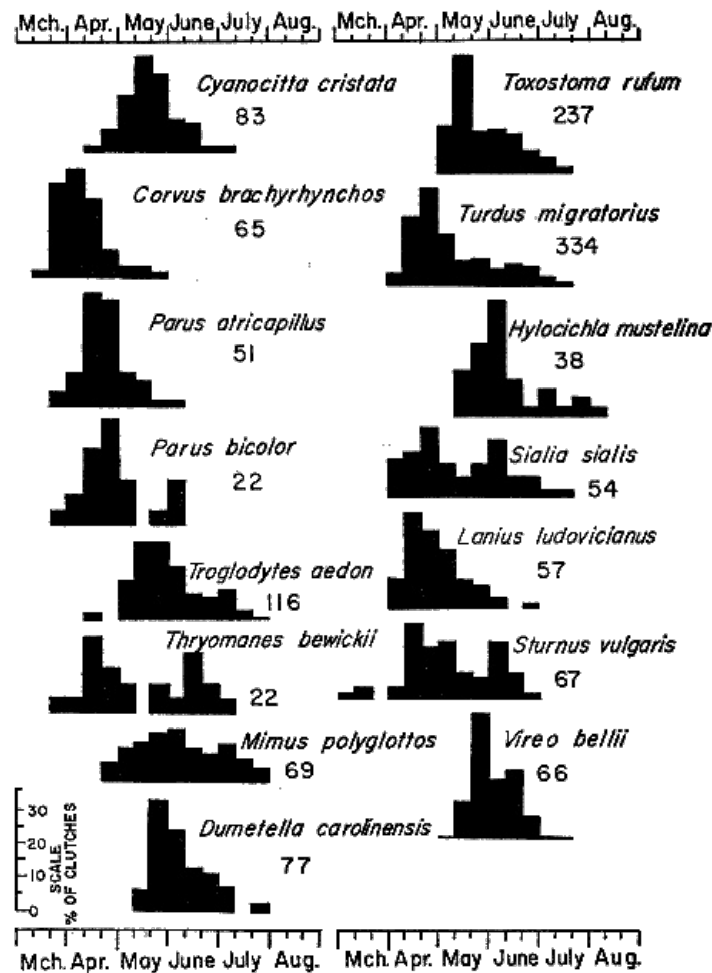


FIG. 7.—Histograms representing breeding schedules of crows, chickadees, wrens, thrashers, thrushes, and their allies in Kansas. See legend to Figure 1 for explanation of histograms.

Carolina Chickadee: *Parus carolinensis atricapilloides* Lunk.—This resident is common in the southernmost tier of counties, from Comanche County east, in forest and woodland edge. Actual records of breeding are from Barber and Montgomery counties.

Breeding schedule.—There are no data on breeding of this species in Kansas.

Number of eggs.—Clutch-size is about 5 eggs.

Nests are placed in cavities of trees.

Tufted Titmouse: *Parus bicolor* Linnaeus.—This resident is common in the eastern half of Kansas, in woodlands. Specimens taken in the breeding season and nesting records come from east of a line running through Cloud, Harvey, and Sumner counties, and the species probably breeds in Barber County.

Breeding schedule.—Twenty-two records of breeding span the period March 21 to June 10 (Fig. 7); the modal date for laying is April 25, and 54 per cent of all clutches are laid in the period April 11 to 30.

Number of eggs.—Clutch-size is 4 to 5 eggs (4.5; 6).

Nests are placed in cavities about 12 feet high (ranging from three to 30 feet) in elm, oak, cottonwood, hackberry, redbud, osage orange, and nestboxes placed by man.

White-breasted Nuthatch: *Sitta carolinensis* Latham.—This resident in eastern Kansas, in well-developed woodland, is uncommon. *S. c. cookei* Oberholser occurs east of a line running through Douglas and Cherokee counties, on the basis of specimens taken in the breeding season and actual nesting records, and *S. c. carolinensis* Latham occurs in Montgomery and Labette counties. *S. c. nelsoni* Mearns has been recorded in Morton County but probably does not breed there.

Breeding schedule.—Eggs are laid in March and April; young have been recorded being fed by parents throughout May.

Number of eggs.—Clutch-size is between 5 and 10 eggs.

Nests are placed in cavities about 30 feet high in elm and sycamore.

House Wren: *Troglodytes aedon parkmanii* Audubon.—This summer resident is common in

the east and uncommon in the west. Preferred habitat is in woodland, brushland, and urban parkland. House Wrens arrive in eastern Kansas in the period April 3 to 27 (the median is April 19), and are last seen in autumn in the period September 19 to October 13 (the median is September 30).

Breeding schedule.—The 116 records of breeding span the period April 11 to July 31 (Fig. 7); the modal date of laying is May 20. About 45 per cent of all clutches are laid in the period May 11 to 31.

Number of eggs.—Clutch-size is 7 eggs (5.8, 3-7; 20). Clutches laid in May average 6.1 eggs (4-7; 14); those laid in June and July average 5.0 eggs (3-7; 6).

Nests are placed in cavities about ten feet high (ranging from two to 50 feet) in cottonwood, elm, willow, and a wide variety of structures, mostly nestboxes, built by man.

Bewick Wren: *Thryomanes bewickii* Audubon.—This wren is an uncommon resident in Kansas, except for the northeastern quarter, in woodland understory and brushland. *T. b. bewickii* Audubon occurs north and east of stations in Riley, Pottawatomie, Douglas, and Linn counties, and *T. b. cryptus* Oberholser is found south of stations in Greeley, Stafford, and Linn counties; a zone of intergradation occurs between the two named populations. The species occupies marginal habitat in most of Kansas and periodically is reduced in numbers by severe winters.

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Breeding schedule.—Twenty-two records of breeding span the period March 21 to July 10 (Fig. 7); the modal date for first clutches is April 15 and for second clutches June 15.

Number of eggs.—Clutch-size is 5 eggs (5.5, 5-7; 12).

Nests are placed in crevices about five feet high (ranging from zero to nine feet) in trees (oak, cherry, and pear), boulders, and a wide variety of structures, some of them nestboxes, built by man; appropriation and modification of nests of Barn Swallows is known to occur.

Carolina Wren: *Thryothorus ludovicianus ludovicianus* Latham.—This common resident of southeastern Kansas in woodland understory and brushland is uncommon in the northeastern and south-central sectors. Stations of breeding all fall east of a line running through Doniphan, Riley, and western Reno counties. North and west of southeastern Kansas the Carolina Wren is in marginal habitat and periodically is reduced in numbers by severe winters.

Breeding schedule.—Fourteen records of breeding span the period April 11 to August 10; the modal date for laying is April 15, to judge only from the present sample. The species probably breeds also in late March and early April.

Number of eggs.—Clutch-size is 4 eggs (4.2, 3-8; 9).

Nests are placed near the ground in stumps, and a wide variety of structures built by man, or in crevices in earthen banks.

Long-billed Marsh Wren: *Telmatodytes palustris dissaëptus* (Bangs).—This is an uncommon summer resident in eastern Kansas in and around marshes. Presumably breeding individuals occur east of stations in Doniphan, Shawnee, and Sedgwick counties, but actual records of breeding come only from Doniphan County (Linsdale, 1928:505). First dates of arrival in spring run from April 19 to 29 (the median is April 22), and dates of last autumnal occurrence are from September 26 to October 31 (the median is October 8).

Breeding schedule.—Eggs are laid from May to August.

Number of eggs.—Clutch-size is 5 or 6 eggs; the range is from 3 to 10 (Welter, 1935).

Nests are woven of broad-bladed grasses, usually no farther than two feet from water or mud, suspended in vertical plant stalks or branches in marshes.

Short-billed Marsh Wren: *Cistothorus platensis stellaris* (Nauman).—This rare and irregular summer resident in northeastern Kansas occurs in wet meadowland. Breeding records are available from Douglas and Coffey counties. Temporal occurrence in the State is at least from April 29 to October 25; early dates are most likely of transients.

Breeding schedule.—Eggs are laid in late July and August.

Number of eggs.—Clutch-size is 6 or 7 eggs.

Nests are woven of plant fibers and placed in vertically-running stalks and stems of grasses and short, woody vegetation, within two feet of the ground.

Rock Wren: *Salpinctes obsoletus obsoletus* (Say).—This species is a common summer resident in western Kansas, in open, rocky country. Specimens taken in the breeding season and actual nests found come from west of stations in Decatur, Trego, and Comanche counties. Dates of occurrence are from April 2 to October 25. Autumnal, postbreeding movement brings the species east at least to Cloud County (October 7, 8, and 12) and Douglas County (October 25).

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Breeding schedule.—Sixteen records of breeding span the period May 11 to July 20; the modal date for egg-laying is June 15.

Number of eggs.—Clutch-size is 5 eggs (4.6, 3-7; 5).

Nests are placed in holes in rocks, occasionally in rodent burrows, from ground level to 80 feet high on faces of cliffs, but there averaging about 20 feet.

Northern Mockingbird: *Mimus polyglottos* (Linnaeus).—This is a common resident in parkland and brushy savannah throughout Kansas. *M. p. polyglottos* (Linnaeus) occurs in the east, and *M. p. leucopterus* (Vigors) in the west; a broad zone of intergradation exists between the two. Most specimens from Kansas are of intermediate morphology.

Breeding schedule.—Sixty-nine records of breeding span the period April 21 to July 31 (Fig. 7); the modal date for first clutches is June 5, but is weakly indicated in the histogram (Fig. 7).

Number of eggs.—Clutch-size is 3 eggs (3.5, 3-5; 27). Size of clutch does not vary seasonally or geographically in the present sample.

Nests are placed about four feet high (two to 10 feet) in osage orange, red cedar, mulberry, scotch pine, catalpa, cottonwood, rose, and arbor vitae.

Catbird: *Dumetella carolinensis* (Linnaeus).—This is a common summer resident in the eastern half of Kansas, but is local in the west, in and near woodland edge and second-growth. First dates of arrival in spring are from April 25 to May 14 (the median is May 6), and last dates of autumnal occurrence are between September 20 and November 16 (the median is September 26).

Breeding schedule.—Seventy-seven records of breeding span the period May 11 to July 31 (Fig. 7); the modal date for egg-laying is May 25, and 57 per cent of all clutches are laid from May 21 to June 10.

Number of eggs.—Clutch-size is 4 eggs (3.3, 2-5; 43). Clutches laid between May 11 and June 10 tend to be of 4 eggs (3.5, 2-5; 27), and clutches laid between June 11 and July 31 tend to be of 3 eggs (2.9, 2-4; 16).

Nests are placed about four feet high in shrubs (rose, lilac, plum, elderberry) and about seven feet high in trees (red cedar, honey locust, willow, elm, apple, and in vines in such trees).

Brown Thrasher: *Toxostoma rufum* (Linnaeus).—This is a common summer resident in woodland understory, edge, and second-growth. *T. r. rufum* (Linnaeus) occurs in eastern Kansas, to the western edge of the Flint Hills, and *T. r. longicauda* Baird occurs west of stations in Decatur, Lane, and Meade counties; the intervening populations are of intermediate morphologic character. Some individuals overwinter in Kansas, but most are regular migrants and summer residents, arriving in spring from April 1 to April 25 (the median is April 19), and departing in autumn between September 19 and October 13 (the median is September 28).

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Breeding schedule.—The 237 records of breeding span the period May 1 to July 20 (Fig. 7); the modal date for egg-laying is May 15, and one-third of all eggs are laid in the period May 11 to 20.

Number of eggs.—Clutch-size is 4 eggs, ranging from 2 to 5. Seasonal variation and mean values are shown in Table 15.

Nests are placed about four feet high (ranging from 1²/₃ to 15 feet) in osage orange, elm, ornamental evergreens, gooseberry, barberry, honey locust, cottonwood, red cedar, rose, plum, honeysuckle, spirea, arbor vitae, willow, oak, apple, dogwood, and maple.

TABLE 15.—SEASONAL VARIATION IN CLUTCH-SIZE OF THE BROWN THRASHER

TIME	Mean clutch-size	Number of records
May 1-10	3.3	15
May 10-20	3.9	38
May 21-31	4.1	13
June 1-10	3.5	13
June 11-20	3.5	12
June 21-30	3.4	9
July 1-10	3	1
July 11-20	3	1
All:	3.63	102

Robin: *Turdus migratorius migratorius* Linnaeus.—This summer resident is common in the east, and is locally common in the west. Some individuals, usually in small groups, can be seen throughout the winter in eastern Kansas, and their presence makes it difficult to document dates of arrival and departure of the strictly summer resident birds; these can be said to arrive

in March and to leave in October, but these indications are the barest approximations.

Breeding schedule.—The 334 records of breeding span the period April 1 to July 20 (Fig. 7); the modal date of laying of first clutches is April 25, but subsequent peaks are indistinct. Nearly half of all eggs are laid in the period April 11 to 30.

Number of eggs.—Clutch-size is 3 eggs (3.6, 3-6; 57). Clutches laid prior to May 10 average 3.6 eggs (3-6; 47), and those laid subsequent to May 10 average 3.5 eggs (3-4; 10).

Nests are placed about 13 feet from the ground (ranging from two to 30 feet) in elm, ornamental conifers, fruit trees, cottonwood, mulberry, walnut, hackberry, oak, ash, maple, osage orange, and coffeeberry. Robins rarely nest in manmade structures, such as on rafters in sheds and barns, on bridge stringers, and, exceptionally, on electrical utility pole installations.

Wood Thrush: *Hylocichla mustelina* (Gmelin).—This is an uncommon summer resident in eastern Kansas, presently absent from the State west of stations in Cloud and Barber counties. Preferred habitat is found in understory of forest and woodland. Wood Thrushes appear to have nested in small numbers as far west as Oberlin, Decatur County (Wolfe, 1961), some 50 years ago, but have since disappeared from such places, probably as a result of progressive modification of watershed and riparian timber by man. First dates of arrival in spring are from April 19 to May 20 (the median is May 9), and departure southward is in the period September 3 to October 1 (the median is September 15).

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Breeding schedule.—Thirty-eight records of breeding fall in the period May 11 to August 10 (Fig. 7); the modal date of egg-laying is June 5 for first clutches. Fifty-five per cent of all eggs are laid between May 21 and June 10.

Number of eggs.—Clutch-size is 3 eggs (3.4, 3-4; 9).

Nests are placed about 11 feet high in elm, dogwood, willow, linden, and oak.

Eastern Bluebird: *Sialia sialis sialis* (Linnaeus).—This locally common resident and summer resident in eastern Kansas, is only casual west of Comanche County, in open parkland and woodland edge.

Breeding schedule.—Fifty-four records of breeding span the period April 1 to July 20 (Fig. 7); the modal date for first clutches is April 25 and for second clutches is June 5.

Number of eggs.—Clutch-size is 5 eggs (4.9, 4-6; 15).

Nests are placed in cavities about eight feet high in trees (elm, box elder, fruit trees, willow, and ash), and about four feet high in stumps, fence posts, and nestboxes placed by man.

Blue-gray Gnatcatcher: *Polioptila caerulea caerulea* (Linnaeus).—This summer resident is common in eastern Kansas in brushy woodland, edge, and second growth. Specimens taken in the breeding season and nesting records come from east of stations in Riley and Cowley counties, but there is a breeding specimen from Oklahoma just south of Harper County, Kansas. The species is present from March 30 to September 18.

Breeding schedule.—Twelve records of breeding span the period April 20 to June 20; the modal date for egg-laying is May 10.

Number of eggs.—Clutch-size is about 5 eggs.

Nests are placed in forks or on limbs about 17 feet high in oak, elm, honey locust, red haw, pecan, and walnut.

Cedar Waxwing: *Bombycilla cedrorum* Vieillot.—This waxwing is a rare, local, and highly irregular summer resident in northeastern Kansas, in woodland and forest edge habitats. The known nesting stations are in Wyandotte and Shawnee counties; six nests have been found in the period 1949 to 1960. The species has been recorded in all months.

Breeding schedule.—Eggs are laid in June and early July.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898).

Nests are placed four to 24 feet high in a variety of deciduous and coniferous trees and shrubs.

Loggerhead Shrike: *Lanius ludovicianus* Linnaeus.—This common resident and summer resident favors open country with scattered shrubs and thickets. *L. l. migrans* Palmer occurs in eastern Kansas, west to about the 96th meridian, and *L. l. excubitorides* Grinnell occurs in western Kansas, east to about the 100th meridian; populations of intermediate character occupy central Kansas. These shrikes tend to be resident in southern counties, but are migratory in the north. Dates of spring arrival in Cloud County are between March 9 and 31 (the median is March 21) and the birds leave southward between October 19 and December 19 (the median is November 1).

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Breeding schedule.—Fifty-seven records of breeding span the period April 1 to June 30 (Fig.

7); the modal date for egg-laying is April 15.

Number of eggs.—Clutch-size is 5 eggs (5.3, 4-7; 32). There is no seasonal variation in the sample.

Nests are placed about six feet high (ranging from four to 10 feet) in osage orange, small pines, honeysuckle vines, and elm.

Starling: *Sturnus vulgaris* Linnaeus.—This species is a common resident in towns and around farms, foraging in open fields of various kinds. Starlings (introduced into North America from European stocks of *S. v. vulgaris*) first appeared in eastern Kansas in the early 1930s and were established as successful residents by 1935 or 1936. Occupancy of Kansas to the west took only a few years. There are no specimens taken in the breeding season or actual nesting records from southwest of Ellis and Stafford counties; Starlings seem to be resident in Cheyenne County, but no nesting record exists from there.

Breeding schedule.—Sixty-seven records of breeding span the period March 1 to June 30 (Fig. 7); the modal date for first clutches is April 15, and for second clutches is June 5.

Number of eggs.—Clutch-size is 5 eggs (5.2, 4-8; 19).

Nests are placed about 22 feet high (ranging from eight to 50 feet) in crevices in elm, locust, hackberry, nestboxes placed by man, and in a variety of other structures of man.

Black-capped Vireo: *Vireo atricapilla* Woodhouse.—This was a summer resident, apparently of limited distribution but in good numbers, in Comanche County, in oak woodland and brushland edge. No specimens have been taken in Kansas since 1885.

Breeding schedule.—Eggs are probably laid in May and June. Goss (1891:351) found a nest under construction on May 11, 1885, and this is the only nesting record of the species in the State.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898).

Nests are placed low, perhaps around four feet high, in deciduous trees and shrubs (Davie, *op. cit.*).

White-eyed Vireo: *Vireo griseus noveboracensis* (Gmelin).—This is a local summer resident in eastern Kansas, in woodland and forest edge. Stations of breeding occurrence are in Doniphan, Douglas, Johnson, Anderson, Labette, and Montgomery counties. The species is present within the extreme dates of April 23 to October 5 (Table 16).

Breeding schedule.—Ten records of breeding span the period May 10 to June 30; the modal date for egg-laying is June 10. The present sample is not adequate to indicate extreme or modal dates with reasonable accuracy.

Number of eggs.—Clutch-size is 4 eggs (3.6, 3-4; 5).

Nests are placed relatively low in forks in trees and shrubs.

Bell Vireo: *Vireo bellii bellii* Audubon.—This summer resident is common in riparian thickets and second-growth scrub. Temporal occurrence is indicated in Table 16.

Breeding schedule.—Sixty-six records of breeding span the period May 1 to July 20 (Fig. 7); the modal date for egg-laying is May 25, and a little under 40 per cent of all eggs are laid in the period May 21-31. Renesting following disruption of first nests is regular, and the small peak in the histogram in the period June 11-20 is representative of this.

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Number of eggs.—Clutch-size is 4 eggs (4.6, 3-6; 21). Clutches in May have an average of 3.7 eggs, and those in June and July 3.6 eggs.

Nests are placed about two feet high (ranging from one to five feet) in terminal or lateral forks of small branches in elm, hackberry, osage orange, coralberry, dogwood, plum, honey locust, mulberry, willow, cottonwood, and box elder.

Yellow-throated Vireo: *Vireo flavifrons* Vieillot.—This is a rare and local summer resident in deciduous forest and woodland in eastern Kansas. Stations of breeding occurrence fall east of Shawnee and Woodson counties. Temporal occurrence is indicated in Table 16.

Breeding schedule.—Eggs are laid at least in May.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed 16 to 30 feet high in forks of mature deciduous trees.

Red-eyed Vireo: *Vireo olivaceus olivaceus* (Linnaeus).—This summer resident is common in the east, but is local and less abundant in the west, in woodland and deciduous forest. Temporal occurrence is indicated in Table 16.

Breeding schedule.—Eight records of breeding fall in the period May 21 to July 31; most records of egg-laying are in the first week of June.

Number of eggs.—Clutch-size is 4 eggs (4.0, 3-5; 5).

Nests are placed in forks of mature deciduous trees, usually fairly high—perhaps 15 to 25 feet (Davie, 1898).

TABLE 16.—OCCURRENCE IN TIME OF SUMMER RESIDENT VIREOS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
White-eyed Vireo	Apr. 23-May 25	May 8	Oct. 5	.....
Bell Vireo	Apr. 14-May 20	May 8	Aug. 26-Sept. 27	Sept. 6
Yellow-throated Vireo	Apr. 27-May 22	May 7	Aug. 23-Oct. 1	Aug. 31
Red-eyed Vireo	Apr. 21-May 10	May 4	Sept. 2-Oct. 7	Sept. 10
Warbling Vireo	Apr. 20-May 9	Apr. 28	Sept. 2-Oct. 6	Sept. 9

Warbling Vireo: *Vireo gilvus gilvus* (Vieillot).—This summer resident is common in woodland and forest edge. Temporal occurrence is indicated in [Table 16](#).

Breeding schedule.—Seventeen records of breeding span the period May 1 to June 20, but it is likely that breeding later in June and July will be recorded. The modal date for egg-laying is June 5, and this seems to be a reliable index to the major effort in egg-laying in spite of the small sample.

Number of eggs.—Clutch-size is 4 eggs (3.6, 3-4; 5). Nests are placed three to 25 feet high in a variety of deciduous shrubs and trees.

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Black-and-white Warbler: *Mniotilta varia* (Linnaeus).—This local and uncommon summer resident lives in deciduous forest and woodland. Specimens taken in the breeding season and actual records of nesting come from Doniphan, Douglas, Coffey, Greenwood, Sedgwick, Labette, and Cherokee counties. Temporal occurrence in the State is indicated in [Table 17](#).

Breeding schedule.—Eggs are laid in May and June.

Number of eggs.—Clutch-size is around 5 eggs (Davie, 1898).

Nests are placed on the ground, in depressions or niches, under heavy cover.

Prothonotary Warbler: *Protonotaria citrea* (Boddaert).—This is a local summer resident in eastern Kansas, in understory of riparian timber and swampy woodland. Specimens taken in the breeding season and actual records of nesting come from Doniphan, Douglas, Linn, and Cowley counties. Temporal occurrence is indicated in [Table 17](#).

Breeding schedule.—Twenty-two records of breeding span the period May 11 to July 10 ([Fig. 8](#)); the modal date for egg-laying is June 5, and 75 per cent of all clutches are laid in the period June 1 to 20.

Number of eggs.—Clutch-size is 5 eggs (4.5, 3-6; 15).

Nests are placed in holes and niches in willow, red haw, elm, and a variety of stumps, about eight feet high (ranging from five to 20 feet), usually over water. A pair nested once in a gourd under the eave of a house in Winfield, Cowley County, and another pair in a tin cup on a shelf at a sawmill (Goss, ex Long, 1936).

Parula Warbler: *Parula americana* (Linnaeus).—This summer resident in eastern Kansas usually can be found in heavy woodland and flood-plain timber. Specimens taken in the breeding season and actual records of breeding come from Doniphan, Riley, Douglas, Montgomery, Labette, and Cherokee counties. Temporal occurrence is indicated in [Table 17](#).

Breeding schedule.—Eggs are laid at least from mid-May to mid-June.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed in debris in root tangles along stream banks, and, presumably, in pendant arboreal lichens.

Yellow Warbler: *Dendroica petechia* (Linnaeus).—This summer resident is common in the east, in woodland and riparian growths. *D. p. aestiva* (Gmelin) occupies eastern Kansas west at least to Barber County, but it is not known how far west representatives of this population breed. *D. p. morcomi* Coale breeds in western Kansas. *D. p. sonora* Brewster, a name applicable to Yellow Warblers of the southwestern United States and northern Mexico, has been considered a "straggler" (Long, 1940) or probable summer resident (Tordoff, 1956; Johnston, 1960) in southwestern Kansas, on the basis of one specimen taken on June 24, 1911, at a point two miles south of Wallace, Wallace County. This specimen, which is pale, was identified in

1935 as *D. p. sonorana* by H. C. Oberholser. Specimens taken subsequently from Cheyenne, Hamilton, and Morton counties in the breeding season can be referred adequately to *D. p. morcomi*. Probably the specimen of 1911 is a pale variant of *D. p. morcomi* within its normal distributional range. *Breeding schedule*.—Thirty-five records of breeding span the period May 11 to June 20 ([Fig. 8](#)); this probably is inadequate to show the extent of the season, and some egg-laying into July is likely to be found in the future. The modal date of egg-laying is May 25, and this is likely to be reliable.

Number of eggs.—Clutch-size is 4 eggs (4.2, 3-5; 29).

Nests are placed about nine feet high (ranging from five to 20 feet) in crotches of trees and shrubs including willow, elderberry, cottonwood, crabapple, plum, and coralberry.

Prairie Warbler: *Dendroica discolor discolor* (Vieillot).—This rare, local summer resident occurs in deciduous second-growth. The only breeding records are from Wyandotte and Johnson counties.

Breeding schedule.—Eggs are laid at least in June.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898).

Nests are placed low, perhaps about four feet high, in a wide variety of small trees and shrubs.

Louisiana Waterthrush: *Seiurus motacilla* (Vieillot).—This uncommon to rare summer resident in eastern Kansas lives in woodland understory near streams. Nesting records come from Douglas, Miami, Linn, and Crawford counties. Wolfe (1961) reports he found a nest with young near Oberlin, Decatur County, on June 10, 1910, under an overhanging bank of Sappa Creek; Decatur County is some 250 miles west of the present western limit of the breeding range of the Louisiana Waterthrush, and western habitats are not favorable for their occurrence. Temporal characteristics of their distribution are indicated in [Table 17](#).

Breeding schedule.—Eggs are laid in May and June.

Number of eggs.—Clutch-size is about 5 eggs (Davie, 1898).

Nests are placed in concealed places in banks or stumps always where it is wet.

TABLE 17.—OCCURRENCE IN TIME OF SUMMER RESIDENT WOOD WARBLERS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Black-and-white Warbler	Apr. 2-May 12	May 5	Sept. 10-Oct. 14	Sept. 22
Prothonotary Warbler	Apr. 24-May 25	May 8	Aug. 6-Sept. 10	Aug. 22
Parula Warbler	Apr. 6-May 5	Apr. 23	Sept. 12-Oct. 7	Sept. 18
Yellow Warbler	Apr. 21-May 7	Apr. 30	Aug. 28-Oct. 1	Sept. 4
Louisiana Waterthrush	Apr. 2-May 2	Apr. 16	Aug. ?	.....
Kentucky Warbler	Apr. 24-May 15	May 3	Sept. 13	.....
Yellowthroat	Apr. 21-May 10	May 3	Sept. 8-Oct. 3	Sept. 17
Yellow-breasted Chat	Apr. 29-May 19	May 11	Aug. 29-Oct. 1	Sept. 8
American Redstart	Apr. 22-May 20	May 12	Sept. 1-Oct. 7	Sept. 10

Kentucky Warbler: *Oporornis formosus* (Wilson).—This is an uncommon summer resident in eastern Kansas, in deciduous forest and woodland. Specimens taken in the breeding season and actual records of nesting come from Riley, Doniphan, Douglas, Leavenworth, Linn, Montgomery, and Labette counties. Temporal occurrence is indicated in [Table 17](#).

Breeding schedule.—Eggs are laid in May and June.

Number of eggs.—Clutch-size is 4 or 5 eggs.

Nests are placed near or on the ground, usually at the base of small shrubs or clumps of grass.

Yellowthroat: *Geothlypis trichas* (Linnaeus).—This summer resident in and near marshes is common in the east and is local and somewhat less common in the west. *G. t. brachydactylus* (Swainson) breeds east of stations in Clay, Greenwood, and Montgomery counties, *G. t. occidentalis* Brewster breeds west of stations in Decatur, Stafford, and Pratt counties, and the intervening area is occupied by warblers of intermediate morphologic characters. Temporal occurrence is indicated in [Table 17](#).

Breeding schedule.—Nine records of breeding span the period May 11 to June 10; the modal date of egg-laying is June 1. The season is probably more extended in time than is indicated by the available records.

Number of eggs.—Clutch-size is 5 eggs (4.8, 4-5; 6).

Nests are placed in cattails and sedges one to two and one-half feet high.

Yellow-breasted Chat: *Icteria virens* (Linnaeus).—This summer resident is common in willow thickets and rank second-growth. *I. v. virens* (Linnaeus) breeds in eastern Kansas, from Nemaha County south, *I. v. auricollis* (Deppe) breeds in western Kansas, from Norton County south, and the intervening sector is occupied by chats of intermediate morphologic character. Temporal occurrence is indicated in [Table 17](#).

Breeding schedule.—Twenty-six records of breeding span the period May 11 to July 20 ([Fig. 8](#)); the modal date for completion of clutches is June 5. Forty-two per cent of all eggs are laid in the period June 1 to 10.

Number of eggs.—Clutch-size is 4 eggs (3.9, 3-5; 21). Clutches in May are larger than those in June and July.

Nests are placed in forks and crotches about three feet high in dogwood, willow, rose, coralberry, cottonwood, and thistles.

Hooded Warbler: *Wilsonia citrina* (Boddaert).—This warbler is a rare summer resident in eastern Kansas, in wet, open woodland. Specimens (a total of four) taken in the breeding season are from Leavenworth and Shawnee counties, and the one nesting record is from Anderson County.

Breeding schedule.—Eggs are laid at least in May.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are low (some as high as six feet) in woody vegetation.

American Redstart: *Setophaga ruticilla ruticilla* (Linnaeus).—This summer resident occurs locally in woodlands east from stations in Cloud and Sumner Counties. Temporal occurrence is indicated in [Table 17](#).

Breeding schedule.—Eggs are laid in May and June.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898), but there are two records of 5 in Kansas. Nests are placed six to 30 feet high, but usually about 12 feet, in forks or saddled on a branch, in deciduous trees.

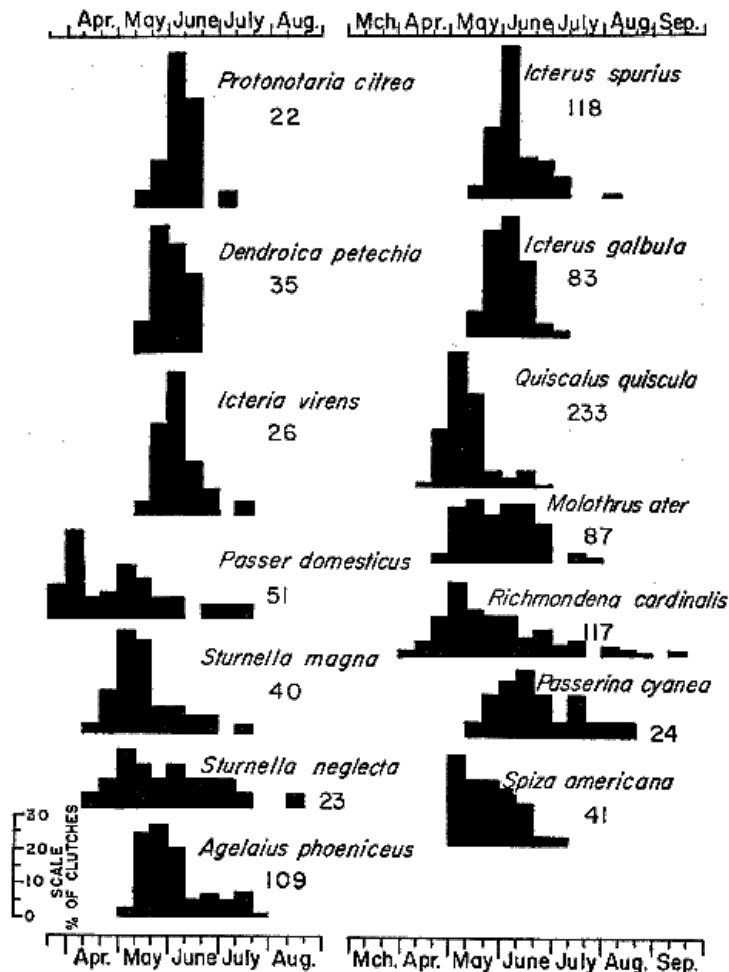


FIG. 8.—Histograms representing breeding schedules of wood warblers, the House Sparrow, icterids, and cardinal grosbeaks in Kansas. See legend to Figure 1 for explanation of histograms.

House Sparrow: *Passer domesticus* (Linnaeus).—This sparrow, introduced from stocks in Ohio and New York (originally from England and Germany), has been present since about 1876 in eastern Kansas; it is a common resident in towns and at farmsteads throughout the state.

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Nomenclaturally, House Sparrows in North America consistently have been referred to the European ancestral stocks, *P. d. domesticus*, but none in North America today duplicates morphologically the European birds. This is evidence of meaningful adaptation of the North American populations to environments in which they now live, and continued use of *P. d. domesticus* is misleading. Studies on local differentiation in North American House Sparrows are in progress, and when the biology of sparrows in the midwest is better understood, suitable nomenclatural proposals will be made.

Breeding schedule.—Fifty-one records of breeding span the period March 20 to July 20 ([Fig. 8](#)); the modal date for laying of first clutches is April 5, and for second clutches May 5.

Number of eggs.—Clutch-size is 4 eggs (3.9, 3-7; 13).

Nests are placed in niches of various sorts seven to 50 feet high in buildings, nestboxes, and trees, or freely situated in forks and crotches of large trees.

Bobolink: *Dolichonyx oryzivorus* (Linnaeus).—This species is a rare and local summer resident, in and about grassy meadows. There are but two stations of breeding in Kansas: Jamestown State Lake, Cloud County, and Big Salt Marsh, Stafford County. Temporal occurrence is indicated in [Table 18](#).

Breeding schedule.—Eggs are laid in June.

Number of eggs.—Clutch-size is about 5 eggs.

Nests are placed on the ground amidst grasses.

Eastern Meadowlark: *Sturnella magna* (Linnaeus).—This summer resident and resident is common in eastern Kansas, in moist grassland. *S. m. argutula* Bangs occurs in Montgomery, Labette, and Cherokee counties and intergrades to the north and west with *S. m. magna* (Linnaeus). Good numbers of birds are found east of the Flint Hills, but to the west the species is of restricted and local distribution. Extreme outliers of the species are found no farther west than stations in Jewell, Stafford, and Barber counties.

Breeding schedule.—Forty records of breeding span the period April 10 to July 20 ([Fig. 8](#)); the modal date for egg-laying is May 5. Fifty-seven per cent of all eggs are laid in the period May 1 to 20.

Number of eggs.—Clutch-size is 5 eggs (5.2, 4-7; 26). Prior to May 11, clutch-size is 5.3 eggs (13 records), and after that date it is 5.1 eggs (13 records).

Nests are placed on the ground, with cover of grasses or forbs.

Western Meadowlark: *Sturnella neglecta neglecta* (Audubon).—This is a common resident and summer resident in western Kansas, and is restricted and local in the east; preferred habitat is in grassy uplands.

Breeding schedule.—Twenty-three records of breeding span the period April 10 to July 30 ([Fig. 8](#)); the modal date for egg-laying is May 5 for first nests and June 5 for second nests.

Number of eggs.—Clutch-size is 4 eggs (4.3, 3-6; 16).

Nests are placed on the ground with cover of grasses or forbs.

Yellow-headed Blackbird: *Xanthocephalus xanthocephalus* (Bonaparte).—This uncommon and local summer resident occurs chiefly in the west, in marshes. Nesting records are from Wallace, Meade, Barton, Stafford, Doniphan, and Douglas counties. Temporal occurrence is indicated in [Table 18](#).

Breeding schedule.—Fifty-one records of breeding span the period May 20 to June 30; the modal date of egg-laying is June 5. The sample is probably not large enough to be wholly reliable.

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Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed within a few feet of water in cattail, rush, sedge, and willow.

Red-winged Blackbird: *Agelaius phoeniceus* (Linnaeus).—This is a common summer resident in marshes, wet pasture, and scrubby parkland throughout the State. *A. p. phoeniceus* (Linnaeus) occurs in most of Kansas and *A. p. fortis* (Ridgway) occurs in the west, east to about Decatur County. A few birds can be found in eastern Kansas in winter; the full breeding population is present between April and October.

Breeding schedule.—The 109 records of breeding in Cloud County span the period May 1 to July 30 ([Fig. 8](#)); the modal date for laying is May 25, and 71 per cent of all eggs are laid in the

period May 11 to June 10. Eighty-eight records of breeding from northwestern Kansas make a histogram almost exactly duplicating the one from Cloud County.

Number of eggs.—Clutch-size at Concordia, Cloud County, is 4 eggs (3.7, 3-5; 48); in northeastern Kansas mean clutch-size is 3.7 eggs (3-5; 46). For the total sample, mean clutch-size in May is 4.0 eggs, in June, 3.7 eggs, and in July, 3.3 eggs.

Nests are placed about four feet high (one to nine feet) in willow, cattail, sedge, grass, elm, exotic conifer, elderberry, coralberry, buttonbrush, honeysuckle, smartweed, ash, osage orange, and yellow clover.

In central Kansas red-wings are host to the Brown-headed Cowbird in a frequency of one parasitized nest out of nine; in northeastern Kansas the ratio is 1:25.

TABLE 18.—OCCURRENCE IN TIME OF SUMMER RESIDENT ICTERIDS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Bobolink	May 4-May 21	May 11	Aug. 28-Oct. 1	Sept. 12
Yellow-headed Blackbird	Mar. 31-Apr. 29	Apr. 19	Sept. 19-Oct. 18	Sept. 24
Orchard Oriole	Apr. 25-May 14	May 4	Aug. 5-Sept. 15	Aug. 9
Baltimore Oriole	Apr. 24-May 5	Apr. 29	Sept. 6-Sept. 29	Sept. 10
Common Grackle	Mar. 2-Mar. 27	Mar. 17	Oct. 15-Nov. 14	Oct. 31

Orchard Oriole: *Icterus spurius* (Linnaeus).—This summer resident is common in parkland, woodland, and old second-growth. Temporal occurrence is indicated in [Table 18](#).

Breeding schedule.—The 118 records of breeding span the period May 11 to August 10 ([Fig. 8](#)); the modal date for completion of clutches is June 5, and 45 per cent of all eggs are laid in the first ten days of June.

Number of eggs.—Clutch-size is 4 eggs (4.1, 3-6; 41). Clutches laid at the peak of the season average 4.3 eggs (3-6; 26), and replacement clutches average 3.8 eggs (3-4; 9). Nests are hung about 15 feet high (ranging from six to 55 feet) in elm, cottonwood, hackberry, locust, catalpa, willow, alder, osage orange, walnut, pear, linden, and ash.

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Baltimore Oriole: *Icterus galbula* (Linnaeus).—This common summer resident is most numerous in the east, in woodland and riparian timber. The species hybridizes freely with the Bullock Oriole in western Kansas, and individuals morphologically typical of Baltimore Orioles are rare west of the 100th meridian. Evidence of such hybridization can be found in specimens taken in eastern Kansas, but the linear nature of distribution along water-courses to the west restricts gene-flow, and evident hybrids are not yet conspicuous. Temporal occurrence is indicated in [Table 18](#).

Breeding schedule.—Eighty-three records of breeding span the period May 11 to July 10 ([Fig. 8](#)); the modal date of egg-laying is June 5, and 66 per cent of all eggs are laid between May 21 and June 10.

Number of eggs.—Clutch-size is 4 eggs.

Nests are hung about 24 feet high (ranging from nine to 70 feet) in elm, cottonwood, sycamore, maple, and oak.

Bullock Oriole: *Icterus bullockii* (Swainson).—This summer resident is common in western Kansas in woodland and riparian situations. The species hybridizes freely with the Baltimore Oriole, and most Bullock Orioles in Kansas show evidence of such interbreeding. Almost all records of breeding come from west of the 100th meridian, but the species in recognizable form probably breeds locally at least as far east as Stafford County.

Breeding schedule.—Few nesting records are available, but these suggest that the breeding schedule of the Bullock Oriole resembles those of the preceding two species in Kansas.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are hung about 26 feet high (ranging from 10 to 50 feet) in cottonwood, elm, and other large trees.

Common Grackle: *Quiscalus quiscula versicolor* Vieillot.—This summer resident is common in parkland, and around towns and farms. Most individuals move out of Kansas in winter, and the temporal occurrence of these birds is indicated in [Table 18](#).

Breeding schedule.—The 233 records of breeding span the period April 11 to June 30 ([Fig. 8](#)); the modal date for egg-laying is May 5, and two-thirds of all eggs are laid between May 1 and May 20.

Number of eggs.—Clutch-size is 5 eggs (4.5, 3-6; 33). Clutches laid at the peak of the season average 4.7 eggs (3-6; 21), and those laid as replacement clutches average 4.3 eggs (3-6; 12).

Nests are placed in forks and crotches about 22 feet high (ranging from six to 50 feet) in elm, red cedar, cottonwood, oak, box elder, and pine.

Brown-headed Cowbird: *Molothrus ater ater* (Boddaert).—Many individuals of this common summer resident overwinter in the southern part of the State and it is difficult to determine dates of arrival and departure in Kansas. Conspicuous abundance in the north covers the period April to October.

Breeding schedule.—The 141 instances of egg-laying span the period April 21 to July 20 (Fig. 8); the modal date of laying is May 15, and 53 per cent of all eggs are laid in the period May 11 to June 10. Inception of laying is here fairly reliably indicated, but in exceptionally early springs laying does occur earlier; a few eggs were found on April 6, 1963, too late for incorporation into this report other than in this sentence.

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Number of eggs.—Clutch-size in cowbirds is not readily determined. On the basis of ovarian examination of five females taken in mid-season, the birds here lay about five eggs at a time. There is no question that the birds are "double-brooded" in Kansas, and the season is sufficiently long for as many as five "clutches" to be laid by a given female.

Eggs are laid in nests of some forty species of birds in Kansas; 39 of these are passerines. No preference for any one species is detectable; the most frequently parasitized species are simply the common species, and these are the kinds for which nesting records are easily gathered by man. In the following list of host species, the names marked with an asterisk are the conspicuously parasitized species.

Mourning Dove, Eastern Kingbird, Eastern Phoebe,* Say Phoebe,* Acadian Flycatcher, Barn Swallow, Horned Lark, Carolina Wren, Rock Wren, Brown Thrasher,* Mockingbird, Catbird, Wood Thrush,* Eastern Bluebird, Yellow-throated Vireo, Bell Vireo,* White-eyed Vireo,* Parula Warbler, Yellow Warbler, Black-and-white Warbler, Kentucky Warbler, Louisiana Waterthrush, Yellow-breasted Chat, Yellowthroat, Eastern Meadowlark, Western Meadowlark, Red-winged Blackbird,* Orchard Oriole,* Cardinal,* Black-headed Grosbeak, Indigo Bunting,* Blue Grosbeak, Dickcissel,* Pine Siskin,* Rufous-sided Towhee,* Grasshopper Sparrow, Lark Sparrow,* Chipping Sparrow, Field Sparrow.*

Scarlet Tanager: *Piranga olivacea* (Gmelin).—This rare summer resident in northeastern Kansas occurs in deciduous forest and bottomland timber. Specimens taken in the breeding season and records of nesting come from Clay, Doniphan, Douglas, Wyandotte, Johnson, and Linn counties, but the species probably occupies the entire eastern third of the State. Dates of arrival in spring are from April 29 to May 25 (the median is May 11), and dates of departure in autumn are from August 4 to September 23 (the median is August 10).

Breeding schedule.—Six records of breeding fall in the period May 11 to June 20.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed 20 to 35 feet high in elm, linden, hickory, and walnut.

Summer Tanager: *Piranga rubra rubra* (Linnaeus).—This uncommon summer resident in eastern Kansas occurs in woodland. Specimens taken in the breeding season and records of nesting come from east of stations in Doniphan, Shawnee, and Montgomery counties. Dates of arrival in spring run from April 24 to May 18 (the median is April 29), and the species departs southward in September and October.

Breeding schedule.—Eleven records of egg-laying cover the period May 21 to July 20; the modal date for laying is June 5.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are situated ten to 20 feet high on horizontal limbs of large trees.

Cardinal: *Richmondia cardinalis cardinalis* (Linnaeus).—This species is a common resident in eastern Kansas, west to about the 99th meridian; west of this line the species becomes local and uncommon to rare. Habitat in the east is found in woodland, edge, second-growth and open riparian timber, and in the west the species is restricted to riparian growths, chiefly along the Republican, Solomon, Smoky Hill, Arkansas, and Cimarron rivers, and their larger tributaries.

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Breeding schedule.—The 117 records of breeding span the period April 1 to September 20 (Fig. 8); the modal date for laying of first clutches is May 1, subsequent to which breeding activity is regular but asynchronous.

Number of eggs.—Clutch-size is 3 eggs (3.5, 3-6; 65). Seasonal variation in clutch-size is as follows:

Date	Mean clutch-size	Number of records
April 1-20	3.0	6

April 21-May 10	3.8	25
May 11-May 31	3.3	15
June 1-June 20	3.6	11
June 21-July 20	3.3	7

Nests are placed about five feet high (ranging from 10 inches to 40 feet) in osage orange, elm, grape, rose, red cedar, coralberry, willow, cottonwood, gooseberry, oak, elderberry, box elder, arbor vitae, Lombardy poplar, Forsythia, pines, honeysuckle, wisteria, lilac, red haw, hickory, dogwood, and sycamore.

Rose-breasted Grosbeak: *Pheucticus ludovicianus* (Linnaeus).—This is a local and at times common summer resident in eastern Kansas, in woodland, edge, and riparian timber. Specimens taken in the breeding season and actual records of breeding come from Clay, Riley, Doniphan, Leavenworth, and Douglas counties. This species meets and hybridizes with the Black-headed Grosbeak west of the Flint Hills. Temporal occurrence in the State is indicated in [Table 19](#).

Breeding schedule.—Eleven records of breeding span the period May 11 to July 10; the modal date for laying is probably June 5.

Number of eggs.—Clutch-size is 3 or 4 eggs.

Nests are placed in deciduous trees, in forks and crotches six to 30 feet high.

Black-headed Grosbeak: *Pheucticus melanocephalus melanocephalus* (Swainson).—This summer resident is common in western Kansas, chiefly along streams. Individuals referable to this species by sight records alone breed in fair numbers as far east as Cloud and Sedgwick counties, but to the east of these stations numbers are reduced, partly as a result of presumed competition with the Rose-breasted Grosbeak. Hybrids between these two grosbeaks are regularly produced. The easternmost record of breeding by this species is at St. Mary's, Pottawatomie County, where a male was seen as probably mated with a female Rose-breasted Grosbeak. Temporal occurrence is indicated in [Table 19](#).

Breeding schedule.—Sixteen records of breeding span the period May 11 to July 10; the modal date for egg-laying is June 5.

Number of eggs.—Clutch-size is about 4 eggs (3.7, 3-4; 4). Nests are placed about 12 feet high in a variety of deciduous trees.

Blue Grosbeak: *Guiraca caerulea* (Linnaeus).—This is a common to uncommon summer resident in most of Kansas, in brushland and streamside thickets. *G. c. caerulea* (Linnaeus) breeds in the east, east of stations in Douglas, Greenwood, and Cowley counties, and *G. c. interfusa* Dwight and Griscom breeds in the west, west of stations in Cloud, Stafford, and Clark counties; a broad zone of intergradation exists between the two named populations. Temporal occurrence is indicated in [Table 19](#).

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Breeding schedule.—Seven records of breeding span the period May 21 to June 30; the modal date of laying seems to be in late May or early June.

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed from three to 30 feet high in a variety of deciduous plants.

TABLE 19.—OCCURRENCE IN TIME OF SUMMER RESIDENT CARDINAL GROSBEAKS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Rose-breasted Grosbeak	Apr. 25-May 5	May 2	Sept. 4-Oct. 1	Sept. 13
Black-headed Grosbeak	Apr. 26-May 11	May 5	Aug. 17-Sept. 18	Sept. 2
Blue Grosbeak	Apr. 25-May 26	May 13	Aug. 15-Sept. 3	Aug. 27
Indigo Bunting	Apr. 20-May 15	May 6	Aug. 23-Oct. 31	Oct. 1
Lazuli Bunting	May 5-May 24	May 10	.....	.....
Painted Bunting	Apr. 30-May 25	May 9	.....	.....
Dickcissel	Apr. 21-May 10	May 4	Sept. 7-Oct. 11	Sept. 18

Indigo Bunting: *Passerina cyanea* (Linnaeus).—This summer resident is common in mixed-field and heavy brushland habitats. The species extends westerly, in riparian situations, in reduced numbers, ultimately meeting and hybridizing with the Lazuli Bunting. Specimens referable to the Indigo Bunting have been taken as far west as Finney County, but most specimens from that far west show evidence of interbreeding with Lazuli Buntings. Temporal occurrence is indicated in [Table 19](#).

Breeding schedule.—Twenty-four records of breeding span the period May 11 to August 20 ([Fig. 8](#)); the modal date for egg-laying is June 15.

Number of eggs.—Clutch-size is 3 eggs (3.1, 2-4; 17).

Nests are placed about three feet high (ranging from one to nine feet) in coralberry, sumac, thistle, sycamore sprouts, hickory sprouts, grape, elderberry, cottonwood, dogwood, ragweed, and grasses.

Lazuli Bunting: *Passerina amoena* (Say).—This uncommon summer resident of western Kansas occurs in edge habitats and streamside thickets. The one breeding record is from Morton County, and there is a breeding specimen taken at Sharon Springs, Wallace County. The species hybridizes with the Indigo Bunting in the western half of the State. Temporal occurrence in spring is indicated in [Table 19](#).

Breeding schedule.—Eggs are laid in June and July.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898).

Nests are placed a few feet from the ground, probably much as are nests of the Indigo Bunting.

Painted Bunting: *Passerina ciris pallidior* Mearns.—This is an uncommon summer resident in the southeastern third of Kansas, in edge habitats and streamside brush. Specimens taken in the breeding season and actual nesting records come from Douglas, Shawnee, Geary, Barber, and Crawford counties. Temporal occurrence in spring is indicated in [Table 19](#).

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Breeding schedule.—Eggs are laid in June and July.

Number of eggs.—Clutch-size is about 4 eggs (Davie, 1898).

Nests are placed in deciduous shrubs and trees.

Dickcissel: *Spiza americana* (Gmelin).—This species is a common summer resident in eastern Kansas and is local and irregular in the west, in grassland habitats. Temporal occurrence is indicated in [Table 19](#).

Breeding schedule.—Forty-one records of breeding span the period May 1 to July 10 ([Fig. 8](#)); the modal date for egg-laying seems to be May 5, but the curiously abrupt inception of breeding described by this sample suggests that more records are needed to document fully the breeding schedule of this species. Breeding in April almost certainly will be found.

Number of eggs.—Clutch-size is about 4 eggs (4.1, 3-5; 14).

Nests are placed about two feet high (ranging from ground level to 12 feet) in grasses, osage orange, sedge, box elder, honey locust, clover, thistle, and blackberry.

Pine Siskin: *Spinus pinus pinus* (Wilson).—This irregular summer resident occurs locally north of the 38th parallel, chiefly around planted conifers. Known stations of breeding are in Hays, Ellis County, Concordia, Cloud County, and Onaga and St. Marys, Pottawatomie County.

Breeding schedule.—Twelve records of breeding span the period March 11 to May 20 ([Fig. 9](#)); most nests have been established in late April or by early May.

Number of eggs.—Clutch-size is about 4 eggs. Of ten nests examined for eggs, five had at least one egg of the Brown-headed Cowbird; if it is assumed that each cowbird egg replaced one of the siskins, mean clutch-size is 3.7 eggs.

Nests are placed about seven feet high (ranging from 3.5 to 13 feet) in red cedar, exotic conifers, and Lombardy poplar.

American Goldfinch: *Spinus tristis tristis* (Linnaeus).—This resident is common in woodland edge, scrubby second-growth, old fields, and riparian thickets. Occurrence tends to be local and at low density in the southwestern sector.

Breeding schedule.—Twelve records of breeding span the period June 20 to September 10 ([Fig. 9](#)); the modal date for laying is August 5.

Number of eggs.—Clutch-size is 4 eggs (4.4, 3-6; 8).

Nests are placed from two to eight feet high in woody or herbaceous vegetation.

Red Crossbill: *Loxia curvirostra* Linnaeus.—This is an uncommon and irregular winter visitant to Kansas, but it nested once in Shawnee County. *L. c. minor* (Brehm), on geographic grounds, probably nested here, but five other subspecies have been recorded in the State and any one of these might have undertaken the aberrant breeding.

Breeding record.—Three eggs, set completed March 24, 1917, Shawnee County; successfully fledged (Hyde, 1917:166). The species usually lays 4 eggs and places its nests in conifers.

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Rufous-sided Towhee: *Pipilo erythrophthalmus erythrophthalmus* (Linnaeus).—This is an uncommon summer resident in eastern Kansas, in understory of woodland and streamside

timber. Specimens taken in the breeding season and actual records of nesting come from east of stations in Cloud, Marion, and Cherokee counties. Temporal occurrence is indicated in [Table 20](#); records of *P. e. arcticus* (Swainson) have been eliminated from the sample as far as has been possible.

Breeding schedule.—Nineteen records of breeding span the period April 21 to August 10 ([Fig. 9](#)); the modal date for egg-laying is May 5.

Number of eggs.—Clutch-size is 4 eggs (4.0, 3-7; 14).

Nests are placed on the ground, in heavy cover.

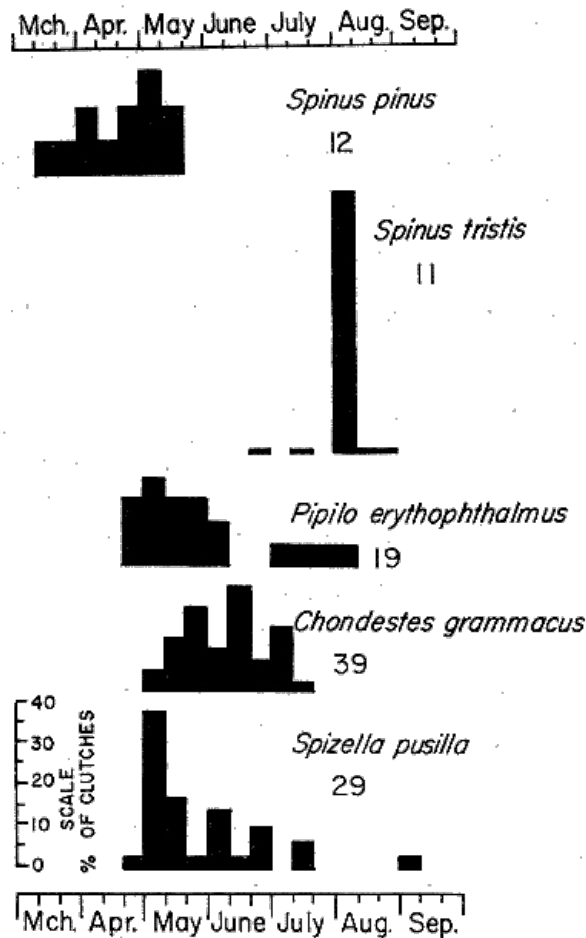


FIG. 9.—Histograms representing breeding schedules of cardueline and emberizine finches in Kansas. See legend to Figure 1 for explanation of histograms.

Lark Bunting: *Calamospiza melanocorys* Stejneger.—This species is ordinarily a common summer resident in western Kansas, in grassland and open scrub. Specimens taken in the breeding season and all breeding records except one for western Franklin County come from west of stations in Decatur, Ellis, and Comanche counties. Irregular fluctuations in breeding density have been recorded from Decatur County (Wolfe, 1961). Temporal occurrence is indicated in [Table 20](#).

[Pg 650]

Breeding schedule.—Fourteen records of breeding span the period May 21 to June 20; the modal date of egg-laying cannot be determined from the present sample.

Number of eggs.—Clutch-size is 4 eggs (4.1, 3-5; 7).

Nests are placed on the ground, at bases of clumps of grasses.

Grasshopper Sparrow: *Ammodramus savannarum perpallidus* (Coues).—This species is a local and at times common summer resident throughout Kansas, in grassland. Temporal occurrence is indicated in [Table 20](#).

Breeding schedule.—Seven records of breeding fall in the period May 1 to June 30; the modal date of laying seems to be about May 21.

Number of eggs.—Clutch-size is 5 eggs (4.8, 4-5; 5).

Nests are placed on the ground or in low vegetation, with cover of grasses or forbs.

Henslow Sparrow: *Passerherbulus henslowii henslowii* (Audubon).—This is an uncommon and local summer resident in eastern Kansas, in grassland. Breeding records are from Cloud, Shawnee, Douglas, Morris, and Anderson counties. Temporal occurrence is indicated in [Table 20](#).

Breeding schedule.—Eggs are laid in May and June.

Number of eggs.—Clutch-size is about 5 eggs.

Nests are placed on the ground, usually in bluestem pasture, but in any case grasses.

Lark Sparrow: *Chondestes grammacus* (Say).—This is a common summer resident in grassland edge habitats. *C. g. grammacus* (Say) breeds east of the Flint Hills, east of stations in Pottawatomie, Anderson, and Montgomery counties, and *C. g. strigatus* Swainson breeds west of stations in Clay, Dickinson, Harvey, and Sedgwick counties; specimens from the intervening area are of intermediate subspecific character. Temporal occurrence is indicated in [Table 20](#).

Breeding schedule.—Thirty-nine records of breeding span the period May 1 to July 20 ([Fig. 9](#)); the modal date for egg-laying is probably May 25, but the sample may not be reliable in this respect.

Number of eggs.—Clutch-size is 4 eggs (4.1, 3-5; 28).

Nests are usually placed on the ground, in cover of pasture grasses, clover, thistle, milo maize, and soybean; there is one record of a nest one and one-half feet high in a small pine.

Cassin Sparrow: *Aimophila cassinii* (Woodhouse).—This is a common summer resident in open scrub and grassland edge, to the south and west of Wallace and Comanche counties. Specimens taken in the breeding season and actual nesting records are from Wallace, Hamilton, Kearny, Finney, Morton, and Comanche counties; the A. O. U. Check-list (1957) cites Hays, Ellis County, as a breeding locality, but it is doubtful that the species now occurs there. *Breeding schedule.*—Eggs are laid in May and June.

[Pg 651]

Number of eggs.—Clutch-size is about 4 eggs.

Nests are placed on the ground, at bases of small bushes.

TABLE 20.—OCCURRENCE IN TIME OF SUMMER RESIDENT AMERICAN BUNTINGS IN KANSAS

SPECIES	Arrival		Departure	
	Range	Median	Range	Median
Rufous-sided Towhee	Apr. 2-Apr. 19	Apr. 9	Sept. 20-Oct. 8	Sept. 29
Lark Bunting	May 5-May 14	May 10	.....	.....
Grasshopper Sparrow	Apr. 12-May 11	Apr. 29	Aug. 20-Oct. 6	Aug. 31
Henslow Sparrow	Apr. 14-Apr. 30	Apr. 22	Oct. 15	.....
Lark Sparrow	Mar. 29-Apr. 21	Apr. 18	Sept. 13-Oct. 16	Oct. 12
Chipping Sparrow	Mar. 6-Apr. 29	Apr. 23	Oct. 3-Nov. 15	Oct. 20
Field Sparrow	Mar. 4-Apr. 28	Apr. 7	Oct. 5-Nov. 12	Oct. 30

Chipping Sparrow: *Spizella passerina passerina* (Bechstein).—This is an uncommon summer resident in open woodland, second-growth, and edge. *S. p. passerina* is found east of stations in Barber and Shawnee counties; Chipping Sparrows are not known to breed farther to the west, but records for north-central Kansas are likely to be found. The subspecific affinities of our Chipping Sparrows are entirely with the nominate subspecies, and there is no basis for earlier reports (Long, 1940; Tordoff, 1956; Johnston, 1960) that *S. p. arizonae* Coues (= *S. p. boreophila* Oberholser) occurs in Kansas.

Breeding schedule.—Nine records of breeding fall in the period May 1 to May 10, in no way indicating the whole span of the breeding season; the species probably lays eggs in May and July, as well as in June.

Number of eggs.—Clutch-size is 4 eggs.

Nests are placed four to 40 feet high in evergreens of a variety of kinds.

Field Sparrow: *Spizella pusilla* (Wilson).—This species is a common summer resident in grassland and edge habitats. *S. p. pusilla* (Wilson) breeds in eastern Kansas chiefly east of the Flint Hills; *S. p. arenacea* Chadbourne breeds in central and western Kansas, intergrading easterly with *S. p. pusilla*.

Breeding schedule.—Twenty-nine records of breeding span the period April 21 to September 10 ([Fig. 9](#)); the modal date for first clutches is May 5.

Number of eggs.—Clutch-size is 4 eggs (4.1, 3-5; 21).

Nests are placed about 10 inches high (ranging from ground level to three feet) in or among coralberry, osage orange, elm, oak, rose, and, once, peony.

Chestnut-collared Longspur: *Calcarius ornatus* (Townsend).—This was formerly a summer resident in western Kansas, in short-grass habitat. The only known nesting area was in the vicinity of Ft. Hays, Ellis County. The species is to be looked for in prairie with short grass type

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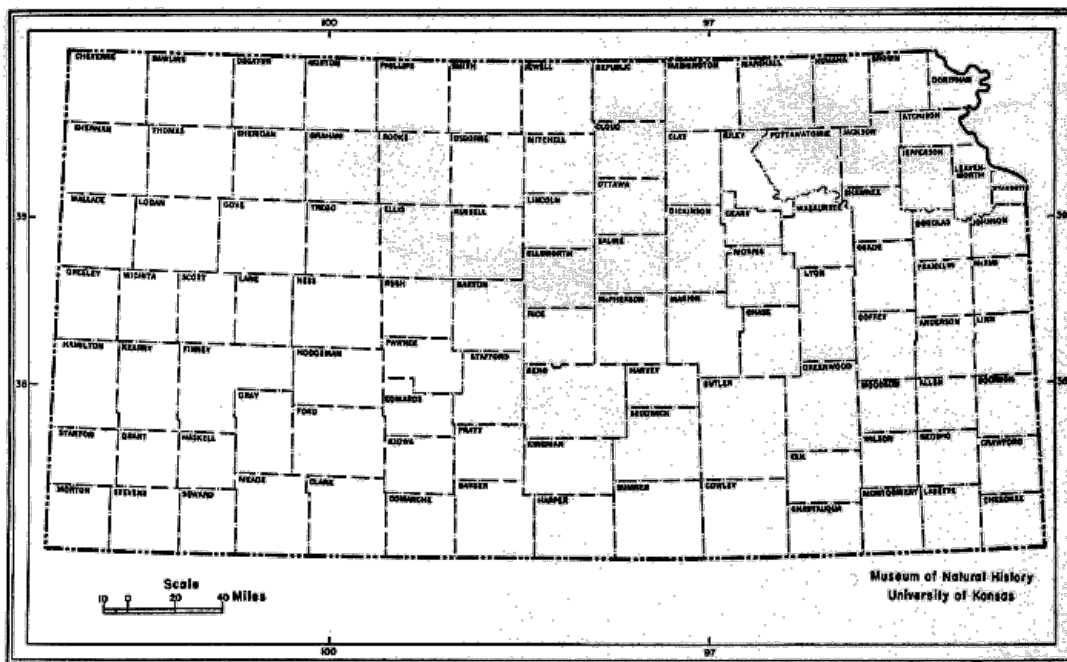
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FIG. 10.—Map of Kansas showing names of counties.

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2. Geographic variation in the harvest mouse, *Reithrodontomys megalotis*, on the central Great Plains and in adjacent regions. By J. Knox Jones, Jr., and B. Mursaloglu. Pp. 9-27, 1 figure in text. July 24, 1961.
3. Mammals of Mesa Verde National Park, Colorado. By Sydney Anderson. Pp. 29-67, pls. 1 and 2, 3 figures in text. July 24, 1961.
4. A new subspecies of the black myotis (bat) from eastern Mexico. By E.

- Raymond Hall and Ticul Alvarez. Pp. 69-72, 1 figure in text. December 29, 1961.
5. North American yellow bats, "*Dasypterus*," and a list of the named kinds of the genus *Lasiurus* Gray. By E. Raymond Hall and J. Knox Jones, Jr. Pp. 73-98, 4 figures in text. December 29, 1961.
 6. Natural history of the brush mouse (*Peromyscus boylii*) in Kansas with description of a new subspecies. By Charles A. Long. Pp. 99-111, 1 figure in text. December 29, 1961.
 7. Taxonomic status of some mice of the *Peromyscus boylii* group in eastern Mexico, with description of a new subspecies. By Ticul Alvarez. Pp. 113-120, 1 figure in text. December 29, 1961.
 8. A new subspecies of ground squirrel (*Spermophilus spilosoma*) from Tamaulipas, Mexico. By Ticul Alvarez. Pp. 121-124. March 7, 1962.
 9. Taxonomic status of the free-tailed bat, *Tadarida yucatanica* Miller. By J. Knox Jones, Jr., and Ticul Alvarez. Pp. 125-133, 1 figure in text. March 7, 1962.
 10. A new doglike carnivore, genus *Cynaretus*, from the Clarendonian Pliocene, of Texas. By E. Raymond Hall and Walter W. Dalquest. Pp. 135-138, 2 figures in text. April 30, 1962.
 11. A new subspecies of wood rat (*Neotoma*) from northeastern Mexico. By Ticul Alvarez. Pp. 139-143. April 30, 1962.
 12. Noteworthy mammals from Sinaloa, Mexico. By J. Knox Jones, Jr., Ticul Alvarez, and M. Raymond Lee. Pp. 145-159, 1 figure in text. May 18, 1962.
 13. A new bat (*Myotis*) from Mexico. By E. Raymond Hall. Pp. 161-164, 1 figure in text. May 21, 1962.
 14. The mammals of Veracruz. By E. Raymond Hall and Walter W. Dalquest. Pp. 165-362, 2 figures. May 20, 1963.
 15. The recent mammals of Tamaulipas, México. By Ticul Alvarez. Pp. 363-473, 5 figures in text. May 20, 1963.
 16. A new subspecies of the fruit-eating bat, *Sturnira ludovici*, from western Mexico. By J. Knox Jones, Jr. and Gary L. Phillips. Pp. 475-481, March 2, 1964.
 17. Records of the fossil mammal *Sinclairiella*, Family *Apatemyidae*, from the Chadronian and Orellan. By William C. Clemens. Pp. 483-491. March 2, 1964.

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1. The amphibians and reptiles of Michoacán, México. By William E. Duellman. Pp. 1-148, pls. 1-6, 11 figures in text. December 20, 1961.
 2. Some reptiles and amphibians from Korea. By Robert G. Webb, J. Knox Jones, Jr., and George W. Byers. Pp. 149-173. January 31, 1962.
 3. A new species of frog (Genus *Tomodactylus*) from western México. By Robert G. Webb. Pp. 175-181, 1 figure in text. March 7, 1962.
 4. Type specimens of amphibians and reptiles in the Museum of Natural History, the University of Kansas. By William E. Duellman and Barbara Berg. Pp. 183-204. October 26, 1962.
 5. Amphibians and Reptiles of the Rainforests of Southern El Petén, Guatemala. By William E. Duellman. Pp. 205-249, pls. 7-10, 6 figures in text. October 4, 1963.
 6. A revision of snakes of the genus *Conopsis* (Family *Colubridae*, from Middle America). By John Wellman. Pp. 251-295, 9 figures in text. October 4, 1963.
 7. A review of the Middle American tree frogs of the genus *Ptychohyla*. By William E. Duellman. Pp. 297-349, pls. 11-18, 7 figures in text. October 18, 1963.
 8. Natural history of the racer *Coluber constrictor*. By Henry S. Fitch. Pp. 351-468, pls. 19-22, 20 figures in text. December 30, 1963.
 9. A review of the frogs of the *Hyla bistincta* group. By William E. Duellman. Pp. 469-491, 4 figures in text. March 2, 1964.

More numbers will appear in volume 15.

Transcriber's Notes.

With the exception of six typographical errors that were corrected and moving the list of Publications to the end of the document, the original text and illustrations are presented as they appeared in the printed version.

Typographical Corrections

Page Correction

585 Myiarchis ⇒ Myiarchus

590 insectivorus ⇒ insectivorous

611 Vieillot was incorrectly italicized.

619 Oberholser was incorrectly italicized.

624 trailii = traillii

642 in ⇒ is

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