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BREEDING-BIRD POPULATION TRENDS IN SOUTHEASTERN KANSAS

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The North American Breeding-bird Survey (BBS) has now been in progress long enough to permit some national and regional 10-year summaries to appear (Zimmerman 1979) and to suggest that more detailed analyses of special regions and local areas might also be of interest. The criteria adopted by the U.S. Fish and Wildlife Service for sampling breeding bird populations in different areas of the country yield data which have statistical significance (Zimmerman 1978, Bystrak 1979). The methods used in making this survey have been published in various sources and have been widely distributed (Robbins and Van Velzen 1967, Bystrak 1979).

This study summarizes the results of this survey for the southeastern corner of Kansas, a biogeographical environment distinct from the remainder of the state (Schoewe 1949, Küchler 1974). The survey in this area was started in 1967 and includes data obtained through 1981.

Description of the Area

Five survey routes occur within the 12 southeastern counties of Kansas (Figure 1). All of these lie within Stratum 33 on the North American Ecological Stratification map adopted by the BBS (Robbins and Van Velzen 1969, Fig. 3). This stratum is essentially the southern portion of the Bluestem Prairie area (Küchler 1974) which extends from central Missouri through east central Kansas and

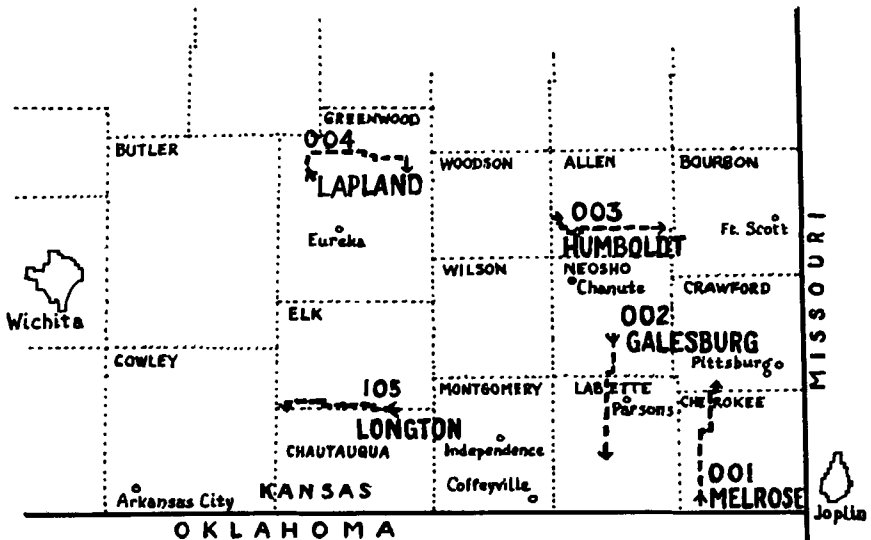


FIGURE 1. Location of the five survey routes in southeastern Kansas.

central Oklahoma to north central Texas. In general, the riparian forests within this stratum are confined to relatively narrow strips (called "galleries" by some writers) bordering the rivers and streams. Most of this stratum is now agricultural, the lower and moister areas mostly cultivated for a variety of crops (extensively in wheat and soybeans), with the upland, drier and rockier areas widely used for cattle grazing. Several large cities—Kansas City, Wichita, Tulsa, Oklahoma City, Dallas and Ft. Worth—are within this stratum. These 5 survey routes lie near the southeastern edge of Stratum 33, which here is adjacent to Stratum 19, representing the Ozarkian forest. They might thus be expected to show certain ecotonal gradients with the Ozarkian forest and thus show population trends at variance with other Kansas routes, although perhaps similar to adjacent Missouri and Oklahoma routes of Stratum 33.

The five study routes are identified both by number and name by the BBS as: Kansas route 001 ("Melrose") near the southeastern corner of the area; KS 002 ("Galesburg") in the east central part of the area; KS 003 ("Humboldt") in the north central part; KS 004 ("Lapland") in the northwestern corner, and KS 105 ("Longton") in the southwestern corner. No route fell in the northeastern corner of this area.

Melrose (001)

This route starts west of Melrose near the southwestern corner of Cherokee County and runs northward through the village of Hallowell to end just across the Crawford County line. This places it on the east side of the Neosho River drainage basin, where the route crosses some 15 to 18 tributaries and drainageways into the river. The adjacent land is primarily agricultural, occupied by numerous rather small farms with narrow galleries along most of the stream tributaries, and frequent hedgerows elsewhere. Most of the galleries have been partially cleared for agriculture. There was extensive deep strip-mining for coal near the middle of the route, but this land has subsequently been "reclaimed" and replaced by broad open rolling surfaces of pasture grasses for extensive grazing. Almost none of the original tall-grass prairies remains, but the narrow strips of mixed riparian forest are still present, although slowly diminishing as a result of further timber cutting and clearing along the stream banks. Removal of some of the hedgerows and fence lines also continues.

Galesburg (002)

This route starts near the center of Neosho County a few miles to the northeast of Galesburg and continues nearly straight south, west of Parsons, to the center of Labette County. It remains on the uplands for almost its entire length except where it crosses Labette Creek at the south end of the Lake Parsons reservoir. There are very few forested strips along drainageways except the broken strip at Labette Creek and scattered trees in the fishing, camping and recreational sites of the Lake Parsons reservoir. Very few avian species occur around or on the lake.

Limited hard rock mining occurs near the southern end of the route, and these areas are being reclaimed for grazing. The land along this route is devoted to small grain agriculture and to grazing in about equal proportions. The farms on this route are fewer and substantially larger and more prosperous than those of the Melrose route. Even hedgerows are fewer and more broken.

Humboldt (003)

The Humboldt route starts near the central western edge of Allen County, a few miles to the northwest of the town of Humboldt, and runs eastwardly directly through this town of about 2200 persons to its terminus near the eastern edge of the county. The route is nearly level and is crossed by the Neosho River on the west edge of Humboldt and by about 5 small streams all running in a southerly direction. The area is almost entirely agricultural, roughly one-third cultivated and two-thirds pastured. Many small trees have developed in the pasture areas, especially where a thin soil overlays rock. In many places these trees have developed open pasture thickets. A thin border of trees follows the streams and

larger drainageways. A large part of the roads and fencerows are accompanied by thick hedgerows. The farms are of medium size and are only moderately prosperous, with some farm houses abandoned where cultivation has yielded to pasturage. There is a small, nearly inactive oil field at the western end of the route. Stops 11 to 15 are urban, with 12 and 13 in the commercial district.

Lapland (004)

This route starts at the place name of Lapland in Greenwood County (the lone store at this site was abandoned and fell into decay perhaps 2 or 3 decades ago), and runs northward nearly 5 miles to the 38th parallel, where it turns abruptly eastward near the northwestern corner of the county. It continues generally eastward and ends near the central eastern edge of the same county. Most of the route occupies the rocky uplands on the eastern slope of a prominent rocky ridge known as the Flint Hills which crosses the state of Kansas in a north-south direction. The headwaters of 5 small creeks cross the route in a southeasterly direction, dissecting the uplands into small but relatively deep valleys. These have narrow borders of forest along their slopes. Heavily grazed native bluestem grasslands occupy most of the area, with a few small cultivated patches here and there in the valley bottoms near the few scattered farmlots. Small farm-pond reservoirs are moderately common in the drainageways bottoms. Scattered fences but few hedgerows divide the rangelands into moderately large grazing units, operated mostly by absentee landowners. Small operating oil wells are sparsely scattered over most of this area, but these are generally clean and undisturbing to both cattle and the wildlife.

Longton (105)

Route 005 was designated as Thrall, located close to Lapland, but it proved to be a very unsatisfactory route for various reasons (impossible roads, for one thing) and after being censused only 3 times it was abandoned and subsequently replaced in 1976 by the Longton route, and given the replacement number 105.

The Longton route starts near the southeastern corner of Elk County, on the Elk-Chautauqua County line south of Longton and runs nearly straight westward to the Flint Hills formation near the southwestern corner of Elk County. This is also mainly on the uplands and is crossed by 10 or 12 small uplands drainageways, the larger bordered by narrow galleries of forest. The uplands are much less rocky than the Flint Hills of the Lapland route, and are a mixture of grazed tallgrass prairie, tame grass pastures and cultivated fields, the latter in the minority. Frequent farm ponds occur in the drainageways. Trees are common in hedgerows and around the infrequent farm buildings. An oil field with a number of operating wells is present along the western end of the route.

General Character of the Survey Area

In summary, this area occupies the southern part of the Osage Cuestas (Schoewe 1949, p. 276) and the Chautauqua Hills as far west as the Flint Hills Upland, passing from the agriculture of a tallgrass prairie-Ozarkian forest ecotone on its eastern edge to that of a Cross Timbers prairie (Kuchler 1974) to the west. The climate is mild with an annual average temperature of 15°C (59°F) and a June average of about 25°C (77°F). The rainfall in June is about 12 cm (5 in.) in the eastern part and 2 cm (an inch) less on its western edge. The winds are quite variable, but moderate, certainly much less pronounced than they are in the central and western parts of the state.

The rocky soils have always been dominated by grazing, but the deeper soils farther to the east, after extensive cultivation in the post-settlement years, have partially given way to more and more grazing in those areas which generally have poor nutrient quality and marginal crop yields. The sharp increase in tree growth which followed the breaking of the prairie sod and suppression of the prairie fires has been followed by gradual clearing and timber (including hedgerow) removal in more recent years. The practices of clear cultivation or large pasture developments have followed the consolidation of land holdings into economical

blocks with uniform management practices. Most of these recent changes have occurred since this breeding-bird survey started, and they are still continuing.

Selection of the Species and Data Analysis

A total of 98 species has been listed on these routes during the 15 years since the start of these censuses. As would be anticipated, 12 of these are very rare and have been observed only on one occasion. Of the remaining 86 species, 56 are sufficiently common to have been observed on at least 1 route on more than half of the census years and are given specific analysis in this report.

The annual variation of some species is so great as to make statistical treatment difficult. Consider, for example, the annual counts of the Upland Sandpiper on the Lapland route starting in 1974: 46, 57, 51, 61, 43, 93, 65, 53; or of the Mourning Dove on the Galesburg route starting with 1969: 46, 42, 65, 66, 55, 45, 48, 107, 53, 53, 101, 31, 85! To detect chronological trends, it was deemed simplest to divide the entire 15-year span into 5 equal periods ("quintiles") and to compare directly their 3-year means. Quintile I represents the mean of the 1967-1969 period, quintile II that of 1970-1972, quintile III of 1973-1975, quintile IV of 1976-1978, and quintile V of 1979-1981. Since not all routes were censused each year, some of the quintile means are for 2 years only, and four are missing entirely. The dashes in Table 1 show the years for which no census figures are available. Fortunately, the last 2 quintiles on all routes are complete. It must be assumed that counts made by different observers are sufficiently uniform to be used for determining the quintile means.

In addition, a population mean, called a "population indicator," is computed by determining the overall mean of a given species per survey route, over all years on all routes in this area. This "indicator" will serve as a base with which to compare the differences between the different routes, and the changes developing between the quintiles. These "population indicators" range from a high of 142 (birds per average route) for the Eastern Meadowlark to a 1 (equals 0.5 to 1.49) for several infrequent species, such as Great Blue Heron, Eastern Bluebird, Lark Sparrow, and others.

Two sets of trends are possible from the data assembled from the censuses of these routes. Of perhaps the greatest interest are apparent changes in populations over a period of successive years, as indicated by the quintile means for each species. The more obvious trends, however, are the geographical distributions with respect to latitude, longitude and physiographic or agricultural environments. Two examples are given to illustrate the manner in which these trends are determined (Tables 1 and 2).

For the Red-winged Blackbird, with a population indicator of 74 (Table 1), there seems to be a general increase from quintile I to quintile V on the Melrose, Galesburg, and Lapland routes in spite of substantial annual fluctuations. Although more erratic, this increase can be detected on the annual counts of the Longton route, on which the highest count was obtained in 1981. (The Humboldt counts are more erratic.) Geographically there appears to be a consistent trend with the highest means found on the two southern routes (90 on Melrose and 109 on Longton) and the lowest means on the northern routes (53 on both Humboldt and Lapland). One hesitates to attribute differences as great as this to chance distribution.

By contrast, the Mockingbird (Table 2) with a population indicator of 28 (birds per average route) shows by quintile means per route an irregular decrease over the years (from about 41 to 19) on all except the Lapland route. On this route the annual census totals show an increase from 1968 to 1976 (5 to 28) followed by an abrupt decrease since that date (from 28 to 6 birds per route). Geographically the two eastern routes show much the highest means (31 for Melrose and 45 for Galesburg) while the two northern routes show the lowest (19 for Humboldt and 15 for Lapland). This indicates a general geographical gradient increasing from the northwest (15) to the southeast (31). In spite of substantial annual variation, this still seems to be significant.

Unfortunately, not all species show such apparent chronological or geographical trends as is illustrated by these two examples. While some show almost no

TABLE 1. Annual census figures and quintile means for Red-winged Blackbird

Route number and name	Census Figures																Total Sum	Total Years
	Years	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981		
Melrose 001		86	54	71	59	93	102	81	65	87	73	115	95	139	112	117	1349	15
Galesburg 002		49	—	53	85	65	64	89	46	68	79	87	97	114	59	108	1063	14
Humboldt 003		—	64	58	13	17	33	—	—	—	99	82	52	47	75	45	585	11
Lapland 004		—	23	22	61	52	—	—	46	56	45	44	67	81	87	55	639	12
Longton 105		—	—	—	—	—	—	—	—	—	101	109	118	117	78	129	652	6
Quintile Means																		
Quintile	I			II			III			IV			V			Population Mean		
Melrose 001	70			85			78			94			123			90		
Galesburg 002	51			71			68			88			94			76		
Humboldt 003	61			21			—			78			56			53		
Lapland 004	23			57			51			52			74			53		
Longton 105	—			—			—			109			108			109		
Population indicator for Red-winged Blackbird																	74	

TABLE 2. Quintile Means for Mockingbird.

Route name and number	Quintile	I	II	III	IV	V	Population Mean
Melrose 001		42	33	29	34	18	31
Galesburg 002		54	48	41	52	31	45
Humboldt 003		28	23	—	17	10	19
Lapland 004		8	15	17	22	11	15
Longton 105		—	—	—	34	17	26
		Population indicator for Mockingbird					28

significant trends, other show erratic or even contradictory trends. For the following species the "population indicator" is within parentheses after the common name.

Population Trends in Southeastern Kansas

Great Blue Heron (1). This species has a mean of 2 birds per route on the western routes, decreasing eastward to less than 1 on the Melrose route. Chronologically, this species has been increasing from less than 1 in quintile I to more than 2 in quintile V, at least on the eastern routes.

Green Heron (2). One or less on the northern routes, increasing southeastward to 3 on Melrose, but decreasing chronologically on the Melrose and Galesburg routes with only erratic changes in the others.

Red-tailed Hawk (1). No significant geographical trends, but decreasing chronologically from 3 to 1 on the northwestern (Humboldt, Lapland and Longton) routes.

American Kestrel (1). In spite of being generally infrequent on all routes, the meager data indicate a geographical decrease from northwest to southeast, and a chronological decrease on all routes, with only a single route represented in the last quintile.

Bobwhite (65). Our fifth most common species in this area, but generally with wide fluctuations. Most abundant on Longton and least on Melrose, but with no apparent west to east trend. Chronologically, however, the eastern routes seem to be showing increasing populations (46 to 57 on Melrose and 62 to 78 on Galesburg) while the western routes are showing decreases (58 to 25 on Lapland and 146 to 69 on Longton).

Killdeer (9). Decreasing irregularly southeastward from 13 on Lapland to 6 on Melrose. There may be a slow temporal increase on the eastern routes which is not evident on the western routes where the populations are higher.

Upland Sandpiper (17). Very common in the Flint Hills area, decreasing rapidly eastward. Apparently showing a strong temporal increase on the western routes and perhaps a slight increase on the others.

Rock Dove (2). Mostly associated with farm buildings and moderately common only on Humboldt, with 8 per route. None in the Flint Hills rangelands. Decreasing on Melrose from 3 in quintile II to none since 1973, but erratic on the Galesburg and Humboldt routes.

Mourning Dove (51). Our sixth commonest species and showing, like the Bobwhite, a high (66) on the Longton route to a low (35) on Melrose, but still with no apparent west to east trend. Chronologically variable with no evident trends.

Yellow-billed Cuckoo (12). A high of 18 on Longton, but with neither geographical nor chronological trends evident.

Black-billed Cuckoo (1). Variable, with a geographical trend increasing from north to south, especially toward the southeast.

Chuck-will's-widow (1). Present only on the western routes, especially on Longton (10), with a temporal distribution showing a prominent peak in the fourth quintile, up to 14 on Longton.

Common Nighthawk (6). There is a strong high of 19 on Lapland, decreasing rapidly to the southeast to a low of 1 on Melrose. There is possibly a slight temporal increase, especially from 2 to 6 on Galesburg.

Chimney Swift (6). There is a high of 12 on Humboldt, decreasing erratically to a low of 1 on Longton. There appears to be a chronological increase from 1 to 14 on Humboldt, and a tendency to decrease on the other routes, but with no clear trends.

Common (Yellow-shafted) Flicker (2). A southeastward decrease from 3 on Lapland to 1 on Galesburg and Melrose. Apparently a slow temporal decrease on all routes except Humboldt, which is erratic.

Red-bellied Woodpecker (6). Here there is a high of 9 on Melrose with an irregular decrease to the west and north. The Melrose route shows an increase from 4 to 11 from quintiles I to V, but the other routes show no apparent trends.

Red-headed Woodpecker (3). This species decreases from the northwest to the southeast from 6 to 2, but seems to be erratic in its chronological populations with no apparent trends.

Red-headed Woodpecker (3). This species decreases from the northwest to the southeast from 6 to 2, but seems to be erratic in its chronological populations with no apparent trends.

Downy Woodpecker (1). Infrequent on all routes with no evident trends.

Eastern Kingbird (11). Moderately common on all routes, but with no apparent geographical or chronological trends.

Scissor-tailed Flycatcher (5). These birds show a north-south gradient from 2 on Humboldt to 8 on Longton. The temporal decrease on the Galesburg and Humboldt routes may not be significant.

Great Crested Flycatcher (7). This species also shows an increase southward from 2 to 11, possibly with chronological increases on the western routes.

Eastern Phoebe (1). The populations of the Phoebes tend to be rather erratic but with no apparent trends.

Eastern Wood Pewee (1). These show populations of 1 on the northern and western routes increasing to 3 southeastward on the Melrose route, but with no changes over the years.

Horned Lark (2). There seems to be a general decrease southward from 5 on Humboldt to 1 on Longton with slight chronological decreases except on Galesburg, which shows a slight increase. These changes may not be significant.

Rough-winged Swallow (1). These totals are erratic and show no trends.

Barn Swallow (19). Here there is a high of 25 on the Lapland route, decreasing southeastward to a low of 16 on Melrose and 13 on Galesburg. Chronological changes are variable with no evident trends.

Blue Jay (5). This species seems to have a preference for urban communities, which may account for its population high of 11 on Humboldt, the only one of these routes which includes an urban center. The other routes suggest a slow temporal decline over the years.

Common Crow (33). In spite of highly erratic counts, as high as 70 in 1980 on the Longton route and as low as zero on Galesburg on the same year, the only trend which appears to be significant is that of lower means on the northern routes (22 on Humboldt) and higher means to the south (52 on Longton).

Black-capped Chickadee (1). Present only on the northern routes, especially on Humboldt, apparently increasing there while decreasing on Lapland. On the southern routes, this species is replaced by the following.

Carolina Chickadee (1). Increasing to the southeast from rare on the Lapland route to 2 on Melrose. No temporal trends have been detected.

Tufted Titmouse (5). This shows a rapid increase to the southeast from 1 on Humboldt to 12 on Melrose. An uncertain decrease seems apparent on all routes (from 16 to 9 on Melrose).

House Wren (1). This species decreases from 3 on the northern routes to few on the southern routes (none on Longton). There is a little evidence of an increase in numbers on the southeastern routes.

Carolina Wren (1). The dramatic disappearance of this species in this area since

1975 (one only in 1977 on Melrose) is well known (see also Arbib 1978). Before 1975 it had a population rating of 3 on Melrose decreasing to less than 1 to the northwest.

Mockingbird (28). There is a strong increase southward from 19 on Humboldt and 15 on Lapland to 31, 45 and 26 on the southern routes, while at the same time an irregular decrease from quintiles I to V is apparent on all routes.

Brown Thrasher (5). The population figures are quite irregular and no significant trends can be discovered.

American Robin (15). Like the Blue Jay, the Humboldt route shows a much higher indicator (25) than the other routes, possibly due to an urban influence. There appear to be significant population increases on all routes except Longton.

Eastern Bluebird (1). The Melrose and Galesburg routes show the abrupt drop since 1973 noted in much of the eastern U.S. (with a single bird on Melrose in 1976), but no such trend is apparent on the routes farther west. Prior to 1973, Bluebirds were more common on the eastern routes than on the western.

Loggerhead Shrike (5). A consistent geographical north to south decrease from 8 to 3, and at the same time an irregular but apparently significant chronological decrease on all routes.

Starling (18). Only the Humboldt route (42) and Galesburg route (24) have significantly large populations, contrasted with a consistent 7 on the other routes. While all routes show substantial annual fluctuations, no temporal trends are evident. The higher incidence of grain and feed cattle farms on the Humboldt and Galesburg routes is probably explanatory.

Bell's Vireo (1). This species is limited to the Melrose and Galesburg routes except for a local population on the Lapland route in 1970 and 1971 only. There is no chronological trend on the two eastern routes.

Common Yellowthroat (3). Increasing southeastward from 1 (Lapland) to 6 (Melrose) per route, with no chronological trends.

Yellow-breasted Chat (1). Mostly limited to Melrose with 2 birds per census, decreasing to 1 bird per census on the last two quintiles. Two scattered observations elsewhere.

House Sparrow (84). The third most common species, showing great fluctuation between adjacent years and between routes. Like the Starling, it is highest (186) on Humboldt, with Galesburg second at 115. The other routes drop sharply to a meager 13 on Longton. The agricultural pattern is again evident here, and no chronological trend can be detected.

Eastern Meadowlark (142). The most abundant species on these routes, highest on Lapland with 222, followed by Longton with 180 and Galesburg with 146. Melrose is low with 88, giving a decreasing gradient from northwest to southeast. The chronological means show substantial irregularities with no discernable trends. Western Meadowlarks occur occasionally on the Lapland route, rarely elsewhere.

Red-winged Blackbird (74). The fourth most common species, with 109 per census on the Longton route and 90 on Melrose. Humboldt and Lapland are low with 53 each, showing a strongly increasing trend from north to south. Chronologically, quintile I is low on 3 of the 4 means and quintile V at or near the highest, demonstrating a definitely increasing trend.

Orchard Oriole (5). Here there is also a definitely increasing north to south trend (2 to 7), but with no significant temporal changes.

Northern (Baltimore) Oriole (3). No definite trends are evident.

Common Grackle (43). Again the "agricultural pattern" (see Starling and House Sparrow) is geographically evident with highs of 72 and 55 on Humboldt and Galesburg respectively and a low of 22 on Melrose. The quintile numbers are still increasing (7 to 111 and 38 to 66) on the two "high" routes, but variable with no detectable gradients on the others.

Brown-headed Cowbird (27). There is a strong high of 53 on the Lapland route where cattle grazing on rangelands dominates the area, dropping to 18 to 28 on the other routes with no definite pattern. The populations seem to be increasing on the Humboldt route and decreasing on Lapland but definite chronological trends are not apparent on the others.

Cardinal (35). A strong northwest to southeast distribution shows a low of 13 on

Lapland to a high of 56 on Melrose. The quintile means are quite variable, but show no trends.

Indigo Bunting (6). Increasing populations from northwest to southeast (2 to 14) but without temporal trends except a decrease from 21 to 8 on Melrose.

Dickcissel (116). The second most common species with a high of 141 on Melrose. Decreases to the west and north are irregular, down to 102 on Longton and 73 on Humboldt. Melrose (97 to 182) and Galesburg (112 to 158) are showing substantial increases, but the populations on other routes are erratic.

American Goldfinch (1). The geographical distribution is irregular (none on Longton), but the numbers are decreasing to zero in quintile V on all routes (1 on Humboldt in 1981).

Grasshopper Sparrow (6). Highest on the Lapland route (24) with only occasional birds on the other routes. Even on Lapland, the numbers have dropped from 49 in quintile II to 12 in quintile V.

Lark Sparrow (1). An indicator of 2 on the Lapland route to 1 on the other routes, and decreasing on all routes, dropping from 4 to 1 on Lapland.

Field Sparrow (3). Increasing geographically from 1 (Lapland) to 6 (Melrose), but with generally decreasing populations on all routes (9 to 2 on Melrose).

Trend Summaries

Geographic Patterns

Breeding birds with larger populations on the southern routes of the area (decreasing northward): Scissor-tailed Flycatcher, Great Crested Flycatcher, Common Crow, Mockingbird, Red-winged Blackbird, Orchard Oriole.

Birds with larger populations on the more northerly routes (decreasing southward): Horned Lark, Black-capped Chickadee, House Wren, Loggerhead Shrike.

Birds with larger populations on the western routes (decreasing eastward): Great Blue Heron, Upland Sandpiper, Chuck-will's-widow.

Larger populations on the eastern part (decreasing westward): Eastern Bluebird (prior to 1973 decline).

Populations decreasing from southeastern to northwestern part of the area: Green Heron, Red-bellied Woodpecker, Eastern Wood Pewee, Carolina Chickadee, Tufted Titmouse, Carolina Wren, Bell's Vireo, Common Yellowthroat, Yellow-breasted Chat, Cardinal, Indigo Bunting, Dickcissel, Field Sparrow.

Populations decreasing from northwest to southeast: American Kestrel, Killdeer, Common Nighthawk, Common Flicker, Red-headed Woodpecker, Barn Swallow, Eastern Meadowlark, Grasshopper Sparrow, Lark Sparrow.

Birds with the highest populations on the "agricultural routes" of Humboldt and Galesburg: Rock Dove, Starling, House Sparrow, Common Grackle. Perhaps associated with these should be Chimney Swift, Blue Jay, and American Robin, which have conspicuous high totals on the Humboldt route, possibly an urban influence.

Species showing no evident geographical distribution gradients: Red-tailed Hawk, Bobwhite, Mourning Dove, Yellow-billed Cuckoo, Black-billed Cuckoo, Downy Woodpecker, Eastern Kingbird, Eastern Phoebe, Rough-winged Swallow, Brown Thrasher, Northern Oriole, American Goldfinch. Also to be included here would be the Brown-headed Cowbird on the southern routes, and the Red-bellied Woodpecker on all routes except Melrose.

Chronological patterns (from quintiles I to V)

Populations increasing: Upland Sandpiper, Common Nighthawk, Red-winged Blackbird, and American Robin (except Longton). The Chuck-will's-widow might be placed here with its high population in quintile IV. Also in this category would be the following with increases on some routes: Great Blue Heron, Bobwhite, Killdeer and Dickcissel (on eastern routes), House Wren (on southeastern routes), Red-bellied Woodpecker (on Melrose), Chimney Swift, Black-capped Chickadee, and Brown-headed Cowbird (on Humboldt), Common Grackle (on "agricultural routes"), and Great Crested Flycatcher (on western routes).

Populations decreasing: American Kestrel, Common Flicker, Tufted Titmouse, Carolina Wren, Mockingbird, Loggerhead Shrike, Yellow-breasted Chat, American Goldfinch, Grasshopper Sparrow, Lark Sparrow, Field Sparrow. Those showing decreases on some routes are the Green Heron and Eastern Bluebird (on eastern routes), the Rock Dove and Indigo Bunting (on Melrose only), the Chimney Swift and Blue Jay (all routes except Humboldt), Horned Lark (all routes except Galesburg), Bobwhite (on western routes), Red-tailed Hawk (on northwestern routes), and the Black-capped Chickadee and Brown-headed Cowbird (on Lapland only).

Populations showing no apparent chronological trends: Mourning Dove, Yellow-billed Cuckoo, Black-billed Cuckoo, Red-headed Woodpecker, Downy Woodpecker, Eastern Kingbird, Eastern Phoebe, Eastern Wood Pewee, Rough-winged Swallow, Barn Swallow, Carolina Chickadee, Brown Thrasher, Starling, Bell's Vireo, Common Yellowthroat, House Sparrow, Eastern Meadowlark, Orchard Oriole, Northern Oriole, and Cardinal. The Common Grackle shows no trend except on the agricultural routes.

In general, species showing increases are open country birds. These are favored by grazing or pasturage or haying of fields, with trees scattered or in broken hedgerows, such as that associated with the livestock industry, as well as with suburban development. Those showing decreases, however, indicate the destruction of the native vegetation, both forest strips and tallgrass prairie, as well as the reduction of hedgerows and wood lots.

Comparison of Trend Studies

The 15-year trend summary of these BBS studies for the entire United States had not yet been released when this paper went to press, so no comparisons can be made here. However, these results can be compared with Zimmerman's 10-year study for the state of Kansas (1979). Allowance must be made for the differences in length of these studies (15 years vs. 10 years) and for the areas covered (5 routes in southeast Kansas vs. 37 routes in the entire state). Although different statistical methods were used, the objectives were the same and the trends seem to be compatible with each other as to temporal changes. Zimmerman's shorter paper did not consider the geographical distribution of the species within the state.

These results agree with Zimmerman's 10-year study in showing a decrease in the Carolina Wren. He also lists as "possibly decreasing" the American Kestrel and Eastern Bluebird. The Kestrel is listed here as apparently decreasing and the Bluebird as decreasing on the eastern (Melrose and Galesburg) routes only. Of those listed by Zimmerman as increasing, these results agree with the increase of the American Robin (with an exception on the Longton route), and with the Killdeer on the eastern (Melrose, Galesburg and Humboldt) routes, but not on the Lapland and Longton routes where they are more numerous. For those listed as "possibly increasing", agreement is found here for the Great Blue Heron and the House Wren for the eastern routes only, but again not on the western where they are more numerous.

Of the other three species (Upland Sandpiper, Common Nighthawk and Red-winged Blackbird) shown as increasing in the present study, this trend had not been detected in Zimmerman's 10-year study, although the Red-winged Blackbird increase was noted in a paper cited by Zimmerman. For those additional species shown as decreasing in this analysis, the Common Flicker, Tufted Titmouse, Mockingbird, Loggerhead Shrike, Yellow-breasted Chat, American Goldfinch, Grasshopper Sparrow, Lark Sparrow and Field Sparrow were all shown in the earlier study as indicating random changes only. Apparently those species showing trends only on certain routes in this report where no trends are indicated elsewhere should be considered, at least for the present, as showing random changes only in their population levels. This would include the Scissor-tailed Flycatcher.

Of special interest here is the recognition of one, and perhaps two, new categories of bird populations, based on their abundance with reference to human

environments. The "agricultural routes" where grain production and livestock feeding are dominant activities seem to be responsible for concentrations of colonial grain-feeding birds, consisting in this area of the Rock Dove, Starling, House Sparrow and Common Grackle.

Less certain are nesting environments provided by the urban house and shade-tree culture which seems to favor a slight but apparently significant increase in the Chimney Swift, Blue Jay and American Robin. I assume that larger urban centers would also show a similar increase for the Common Nighthawk, but no such environments were present on these routes, and the Nighthawks took care of themselves very well on open, rocky rangelands.

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BOOK REVIEW

The Audubon Society Handbook for Birders. Stephen W. Kress. Charles Scribner's Sons, New York, NY. 1981. 322 pages; black and white photographs and line drawings. Hard cover. \$17.95.

This is a techniques manual and source book for the serious bird-watcher who would like to increase his abilities and range of experiences. Chapters cover a wide range of topics—basic field identification, selection and care of optical equipment, photography and sound recording, education opportunities and bird tours, research opportunities for amateurs in established programs, and suggestions for building a bird-watcher's library. The sections on leading field trips and writing field notes are particularly welcome. If you would like a list of bird book dealers or to know if a bird list is available for a particular wildlife refuge or if you could participate in the dead bird survey along the beaches of the Great Lakes or almost anything ornithological, this is a valuable reference. With such a wealth of detailed information, it is not surprising that there are omissions and errors. The *Jack-pine Warbler*, the outstanding quarterly journal of the Michigan Audubon Society, is demoted to a newsletter. In Kansas, the ornithology courses offered at Baker, St. Mary of the Plains, Emporia, Fort Hays, Pittsburg, Kansas Newman, and Southwestern are all noted, but apparently there is no credit course available at the University of Kansas or Kansas State, if this book is to be believed. If you would not want to purchase this reference yourself, I would certainly urge you to have your local library make it available.

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