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STEPHEN A. FORBES, Chief

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On the Numbers and Local Distribution of Illinois Land Birds of the Open Country in Winter, Spring, and Fall

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and
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ARTICLE X.—*On the Numbers and Local Distribution of Illinois Land Birds of the Open Country in Winter, Spring, and Fall.* BY STEPHEN A. FORBES AND ALFRED O. GROSS.

Probably nothing can seem further removed from the sources of interest in ornithology which attract the general bird lover to an observation and study of birds than a mass of statistical data concerning the numbers of the different species in different seasons, regions, and habitats; but with a sufficient exercise of the imagination one may translate this dull array of figures into a captivating vision of the actual bird life of the broad areas from which the data have been drawn—a vision which should add immensely to our conception of the significance of birds in the life of the world and of their interest to the observer and the student of nature. We commonly think of a robin as one of a small, scattered group on a little part of a lawn, searching, with captivating grace and individuality of attitude and action, for the earthworms and insects of its breakfast menu; or of a single meadowlark as piping its lovely lay with generous abandon in the dewy morning from a fence post beside the meadow; but we may multiply our pleasure in the recollection a thousand fold if we can think at once of hundreds of thousands of each, spread over a vast area, their numbers thickening here, diluted there, according to situation and circumstance, like a delicately shaded pigment used to paint a robin picture or a meadowlark picture of the State of Illinois. The reader of our papers must supply the colors, it is true, but that will be easy if he is a well-equipped colorist. It is ours to show where and how and in what depth of tint they must be laid on to make the picture as true as possible to the life of field and forest, thicket and swamp, summer and winter, north and south.

It has been our general plan to work at first with broad strokes of the full brush, refining upon our neutral background by degrees and ending, as we hope to do in a paper following the present one, with the final details for each species taken up separately and followed all over the state and around the year. This one time more, however, we must resume our method of blocking in the skeletal outlines and the basal features of the local ornithology, as intelligently as we can with somewhat inadequate materials, leaving it to others to give life and finish to the sketch.

THE WINTER BIRDS

In planning the presentation of the products of a partial survey of the land birds of Illinois made in 1906, 1907, 1908, and 1909, it seemed best that we should first discuss the species resident in the state in summer and in winter, respectively, following with the much more difficult

treatment of the birds of the transition periods covering the spring and fall migrations. Our report on the summer residents has already been published*, and we have next to report on the winter residents of the state, so far as they were observed in a single season's travel.

The winter season is, of course, in strong contrast to summer in respect to the dominant species of birds and their numbers, and in the greater freedom of their movements, since they have only their own pleasures and welfare to seek, quite free from responsibility for a following generation which in summer individualizes their interests, chains them to one locality, and dominates most of their activities. In winter their gregarious tendencies can assert themselves unchecked, and they move much more generally in flocks, sweeping widely from place to place, as the weather changes, in a free search for shelter and a comparatively scanty food supply. The extremes of the state are also much more unlike at this time than in summer, the southern Illinois birds living under conditions approaching those of the perpetual summer of the tropics, while the northern Illinois birds pass their winter not far outside the edge of a frigid zone. How these differences are expressed in the number of species as well as the population densities of northern and southern Illinois respectively, will presently be shown.

The winter dates of our Illinois bird survey extend from November 23, 1906, to February 21, 1907, the northern Illinois observations having been made from November 23 to 30 and January 2 to 16, those for central Illinois from December 3 to 18 and January 16 to February 1, and those for southern Illinois from February 6 to 21. They show settled winter conditions in each section of the state except that three fall migrants, the Canada goose, Wilson's snipe, and pipit, were seen in northern Illinois in November in very small numbers—2, 1, and 8 respectively. The distances traveled on these winter trips, the acreage covered by the survey, the numbers of birds identified and counted, and the average numbers per square mile are shown in the following table.

ACREAGE OF SURVEY AND NUMBER OF BIRDS
WINTER OF 1906 AND 1907

Section	Miles traveled	Acreage covered	Ratio	No. of birds	Numbers per square mile
Southern	88.9	1422.40	1	1858	836
Central	147.6	2638.76	1.86	1815	440
Northern	130.1	2317.21	1.63	1520	420
State	366.6	6378.37		5193	520

* The Numbers and Local Distribution in Summer of Illinois Land Birds of the Open Country. By Stephen A. Forbes and Alfred O. Gross. Bul. Ill. State Nat. Hist. Surv., Vol. XIV, Art. 6, p. 187-218, Pl. 35-70.

Comparing winter and summer birds of our record for the three sections of the state in the year 1906-07, we find that the winter birds per square mile were fewer by 32% than those of the summer time for central and northern Illinois (430 and 630 respectively), but that the southern Illinois birds were 22.6% more numerous per square mile in winter than in summer (836 to 682). This southward concentration of the birds of the winter will, of course, vary greatly according to the character of the season, severe fall and winter weather equalizing the Illinois distribution by driving the more sensitive species quite beyond the boundaries of the state.

WINTER AND SUMMER BIRDS PER SQUARE MILE, 1906—07

	Winter	*Summer*
Southern	836	682
Central	440	650
Northern	420	610
State	520	644

The complete list of the winter birds of our survey numbers fifty-two species, forty-two of which were in southern, twenty-nine in central, and thirty-one in northern Illinois, or thirty-seven in both the latter taken together. Northern and central Illinois were closely alike in the species of their winter birds, differing mainly in the fact that the horned lark and redpoll came down in very small numbers into the northern part of the state without reaching central Illinois, that another northerner, the Lapland longspur, was very abundant in northern Illinois but rare in central, and that the cardinal, most abundant in the south in winter, was seen in central Illinois but not in northern. In southern Illinois, on the other hand, sixteen species were found which were not seen farther north. Some of these doubtless occurred in central and northern Illinois, but the fact that they were not seen there in 278 miles of travel but were found in southern Illinois in less than a third of that distance, is an indication that, if not wanting in the north, they were at any rate much more abundant southward. Furthermore, the numbers of winter birds per square mile were virtually equal in the two northernmost sections, 100 birds in northern Illinois corresponding to 105 in central, but in southern Illinois the number was virtually twice as great as that of the other sections united, 100 of the latter corresponding to 199 of the former. The following thirteen of our fifty-two winter species are required to make up 85 per cent. of the total number of birds seen and counted in the state, and these taken together averaged 445 to the square mile, or about two birds to every three acres, leaving seventy-five birds to the square mile for the remaining thirty-nine species, or more than eight acres to the bird.

NUMBERS OF THE MORE ABUNDANT WINTER BIRDS OF ILLINOIS, 1906 AND 1907 (85 PER CENT. LIST)

Names	Nos. seen and counted	Nos. per sq. mile
Crow	768	77
Lapland longspur	677	68
Junco	567	57
Prairie horned lark	476	48
English sparrow	414	42
Goldfinch	336	34
Tree sparrow	303	30
Meadowlark	269	27
Quail	234	24
Blue jay	114	11
Cardinal	93	9
Mourning dove	88	9
Chickadee	87	9
Totals	4426	445

THE DATA BY SECTIONS OF THE STATE

Turning now to the sections of the state, we find 1858 birds recorded from southern Illinois—an average of 836 to the square mile. Fourteen of the forty-one species are needed to make up 85 per cent. of the whole number. These more abundant species totaled 706 to the square mile, and the twenty-seven less abundant species, 130 to the mile. Otherwise stated, the fourteen prominent species averaged 112 birds each and the twenty-seven less abundant species averaged fourteen each. The numerical data for the more abundant birds are as follows:

NUMBERS OF THE MORE ABUNDANT WINTER BIRDS OF SOUTHERN ILLINOIS, 1906 AND 1907 (84.5 PER CENT. LIST)

Species	Numbers seen and counted	Numbers per square mile
Junco	416	187
Meadowlark	268	121
Quail	180	81
Bluebird	82	37
Mourning dove	81	36
Blue jay	79	36
Turkey vulture	70	31
Prairie horned lark	63	29
Tufted titmouse	62	28
Carolina chickadee	60	27
Purple finch	58	26
Tree sparrow	53	24
Cardinal	51	23
Song sparrow	44	20
Totals	1567	706

Sixty-nine per cent. of the birds belong to 34 permanent resident species, and 31% to 7 species of winter residents, the latter mainly juncos, purple finches, tree sparrows, and white-throated sparrows.

Central and northern Illinois resembled each other and differed from southern Illinois in the fact that although they are widely unlike in the statistical particulars of our survey, the winter fields of both were swept by ranging flocks of virtually the same gregarious species, which made by far the greater part of the bird population of both sections. Six species out of thirty recorded composed, in these northern sections, 87 and 88 per cent. of the whole number seen. The two following lists of species of principal winter birds differ only in the substitution of the junco in central Illinois for the Lapland longspur in northern; and their combination into one improves our picture of the winter bird life of these parts of the state.

NUMBERS OF THE PRINCIPAL WINTER BIRDS OF CENTRAL ILLINOIS, 1906 AND 1907, (88.5 PER CENT. LIST)

Species	Numbers seen	Numbers per square mile
Crow	526	128
Prairie horned lark	338	82
English sparrow	332	81
Goldfinch	153	37
Junco	141	34
Tree sparrow	113	27
Total	1603	389

NUMBERS OF THE PRINCIPAL WINTER BIRDS OF NORTHERN ILLINOIS, 1906 AND 1907, (87 PER CENT. LIST)

Species	Numbers seen	Numbers per square mile
Lapland longspur	675	186
Crow	207	57
Goldfinch	179	49
Tree sparrow	137	38
Prairie horned lark	75	21
English sparrow	50	14
Total	1323	365

COMBINED MOST ABUNDANT LIST, 1906 AND 1907, CENTRAL AND NORTHERN ILLINOIS, (83.3 PER CENT. LIST)

Species	Numbers counted	Per square mile
Crow	733	95
Lapland longspur	675	87
Prairie horned lark	413	53
English sparrow	382	49
Goldfinch	332	43
Tree sparrow	250	32
Junco	141	19
Total	2926	378

Comparing the foregoing ratios with those of southern Illinois, we see in the winter birds of the southern section a difference from the northern sections in the number of the more dominant species like that to which attention was called in our discussion of the summer birds of the state. To make 85 per cent. of the total number of winter birds we must take for southern Illinois more than 36 per cent. of the species, and for central and northern Illinois only 19 per cent.—fifteen species in southern Illinois as compared with seven in northern-central. The relatively greater ecological complexity of the southern part of the state is thus reflected, in winter as well as in summer, in the greater number of species of birds with numbers large enough to make them important as members of the ornithological community.

The winter birds of central and northern Illinois taken as one area, were fewer per square mile by 32 per cent. than those of the summertime (430 to 630), but the southern Illinois birds were 22.6 per cent. more numerous per square mile in winter than in summer (836 to 682). Our general averages per square mile for the state as a whole were 520 for the winter and 644 for the summer—the winter number nearly 24 per cent. smaller than the summer.

RESIDENCE CLASSES AND THEIR SEASONAL MOVEMENTS

From this point onward, we shall make much use of tables showing the residence classification of the species dealt with, and a few words of general information seem necessary.

Although the birds of a locality or of an area of moderate size and fairly uniform ecological condition, are somewhat definitely divisible into the four classes of permanent residents, winter residents, summer residents, and migrants (the last term being used for those which pass entirely through the area in migration), a strict classification on this basis is impracticable since the northward and southward range of a species

may vary considerably in different years if the critical seasons are much unlike, and the numbers of a species diminish so gradually as the boundaries of its range are approached, that it is usually impossible to draw them distinctly. We have made as definite a residence classification of the birds of our lists for each section of the state as our data will permit, using not only our own observations but all available information both published and unpublished, ignoring, however, merely occasional occurrences and scanty numbers, since these are ecologically insignificant; and we have drawn upon our statistical data to determine as accurately as possible the movements and numerical relations of the different classes in the four annual seasons and the three sections of the state.

It is an interesting fact that only 17.1 per cent. of the 41 midwinter species of our list were winter residents in southern Illinois, the remaining 82.9 per cent. being permanent residents in that region. In central Illinois, on the other hand, permanent resident species were 64.3%, and in northern Illinois 57.2% of the whole number, the ratios thus diminishing rapidly northward. While the winter residence ratios remained fairly uniform (17.1, 17.9, and 19.0, south to north), the summer species present in winter increased in numbers northward (0.0, 14.3, and 19.0), and the migrant species were either absent, or present in only insignificant number.

COMPARISON OF RESIDENCE RATIOS IN SECTIONS OF THE STATE, WINTER OF 1907

Species	Permanent	Winter	Summer	Migrant
Northern	57.2	19.0	19.0	4.8
Central	64.3	17.9	14.3	3.5
Southern	82.9	17.1	0.0	0.0
All Birds				
Northern	62.9	35.5	1.3	0.3
Central	84.3	15.0	0.6	0.1
Southern	69.4	30.6	0.0	0.0
Natives				
Northern	61.4	37.0	1.3	0.3
Central	80.8	18.4	0.7	0.1
Southern	68.9	31.1	0.0	0.0

This is all, of course, what we should expect, more species of birds remaining throughout the year in the more equable southern climate, and the number driven southward in winter increasing as we pass to areas of greater cold. The agreement of our statistics with this obvious inference tends to give us confidence in their sufficiency, although the validity of the exact numbers of our tables is nevertheless left in doubt.

It may seem strange at first that species properly classed as summer residents throughout the state should be more largely represented in

winter in northern Illinois than in central, and more so in central than in southern, but evidently the larger the number of summer species retiring southward in winter the larger will be the number that will leave a few representatives in especially favorable haunts. The summer residents which seemingly linger into winter are very likely migrants from the northern edge of the summer area of the species, accustomed to a lower temperature throughout the year than their fellows. It seems possible, if not probable, that the whole mass of a species moves in migration, not as a mob, but as a more or less fixed array, those northernmost at the beginning of the movement being also northernmost at its end, each part of the array seeking the kind of climate to which it has become accustomed. If this is the case, the summer birds of northern Illinois whose area of summer residence extends farthest northward will be most likely to leave a recognizable number of representatives in northern Illinois in winter, and this will be especially likely if the species contains a large number of birds. Other things being equal, members of the migrating species represented by the largest numbers will be most likely to be found in winter farthest north.

Our tables of residence classification for the three sections of the state and the four seasons of the year show the effect of change of season on the geographical distribution of the *species* tabulated, and the first division of each table is thus the essential part of it; in this the *species* is the unit and not the *bird*. The *number of birds* belonging to a species is a secondary matter in determining its geographical distribution, and as the second and third sections of our tables deal with such numbers, they have relatively little significance in a residence classification.

Winter Birds in Habitats

The acreages of some of the vegetation areas covered by the winter operations of our bird survey—namely, swamps, 22 acres, orchards, 38 acres, yards and gardens, 26 acres—are so small as to be of doubtful value for our purposes, but those of cereal and forage crops, woods, shrubbery, and waste and fallow lands, ranging from 250 to 1790 acres each, may be used to fair advantage. There is, of course, much less to differentiate them as bird resorts when vegetation is dead over all of them and the ground is often covered with snow than there is in the varied and fruitful summer season. The gregarious habit of most winter birds calls for a larger number of observations as essential to dependable averages; the character of the season has much to do with the abundance and southward range of several of our typical winter residents; and it is only by rare chance that the data of a single winter can approximate an average for the winters of a decade. Nevertheless our recorded numbers from different habitats seem worthy of report as a means of depicting the contrast in the bird population of the state

in the seasonal extremes of the year, a view of which is necessary to an understanding of the transition periods of spring and fall.

ACREAGES OF WINTER BIRD SURVEY OF 1906 AND 1907

Habitats	Southern Illinois	Central Illinois	Northern Illinois	State
Corn	229.75	876.12	683.93	1789.80
Wheat	289.29	259.42	76.83	625.54
Stubble	161.99	342.25	305.62	809.86
Plowed ground	18.30	325.31	223.41	567.02
Pasture	184.34	501.58	498.43	1184.35
Meadow	114.34	198.48	305.00	617.82
Swamp	22.27	.....	.....	22.27
Woods	209.55	48.99	58.64	317.18
Orchard	19.02	16.36	2.44	37.82
Shrubs	33.09	11.66	17.95	62.70
Waste and fallow	116.41	35.40	97.86	249.67
Yards and Gardens	8.18	5.47	12.30	25.95
Miscellaneous	15.87	17.72	34.80	68.39
Total	1422.40	2638.76	2317.21	6378.37

In the search for food and protection, the winter birds of the state (mainly seed eaters) were found in the largest numbers in corn fields, pastures, and woodlands—about a fourth of all in the first, a sixth in the second, and an eighth in the last of these situations. In numbers per square mile, the ratios were of course very different, corn fields, wheat, stubble, and pastures having about equal averages, meadows and fields of plowed ground considerably smaller, and the tree and shrub association (orchards, woods, and shrubbery), nearly five times as many to the unit of area as the open country. Indeed, from our numbers per square mile for the whole state it would seem that there are in winter but three classes of bird habitat, the open fields, the woods, wastes, and orchards, and yards, gardens, and shrubbery, represented in our survey by the very unequal areas of 5596, 605, and 89 acres, respectively; the first with 423 birds to the square mile, the second with 1153, and the third with 2676.

To what extent the higher densities are related inversely to the smaller areas of the classes of habitats in which they occur, the birds characteristic of the less extensive habitats being found merely to concentrate there, it is impossible for us to say. The same general relations as to density ratios hold in the sections of the state taken separately, although differences of winter climate and the occasional occurrence of flocks of juncos, tree sparrows, and Lapland longspurs so overweigh the averages in many cases that the detailed figures have little significance.

This disturbing effect of the gregarious habit of winter birds is illustrated by the enormous number per square mile found in the 5½

acres of yards and gardens surveyed in central Illinois—an overplus wholly due to English sparrows—and by the large northern Illinois averages in wheat and meadows, due to flocks of Lapland longspurs encountered in these fields.

NUMBERS SEEN AND COUNTED OF ALL WINTER BIRDS IN THE SEVERAL HABITATS

Habitats	Southern Illinois	Central Illinois	Northern Illinois	State
Corn	497	660	225	1382
Wheat	59	28	326†	413
Stubble	134	135	258†	527
Plowed ground	3	160	30	193
Pasture	164	390	272	826
Meadow	99	23	193†	315
Swamp	42	....	....	42
Woods	521	52	41	614
Orchards	65	14	1	80
Shrubs	104	80	25	209
Waste and fallow	158	110	127	395
Yards and Gardens	10	150*	2	162
Miscellaneous	2	13	20	35
Total	1858	1815	1520	5193

* All English sparrows.
† Mainly Lapland longspurs.

NUMBERS PER SQUARE MILE OF ALL WINTER BIRDS IN THE SEVERAL HABITATS

Habitats	Southern Illinois	Central Illinois	Northern Illinois	State
Corn	1384	482	211	494
Wheat	131	69	271	423
Stubble	529	252	540	417
Plowed ground	105	315	86	218
Pasture	569	498	349	446
Meadow	554	74	405	319
Swamp	1207	....	....	....
Orchard	2187	548	....	1354
Woods	1591	679	447	1239
Shrubs	2011	4391	891	2133
Waste and fallow	555	1989*	831	1013
Yards and Gardens	782	17550†	1041	3995
Miscellaneous	81	469	368	328

* Mainly tree sparrows.
† English sparrows only.

WINTER BIRDS PER SQUARE MILE IN GROUPS OF HABITATS

	Southern	Central	Northern	State
Open fields	626	357	402	423
Woods, waste and orchards	1380	1112	680	1153
Shrubbery, yards and gardens	1768	8593	7849	2676

The *corn field* in winter evidently presents a less dreary aspect to birds than to man, as is shown by our state average of nearly 500 birds to the square mile in that situation. To a winter bird what we call a corn field may often seem to be rather a field of weeds, mainly seed-bearing grasses of the kinds which are likely to take possession, especially in a wet season, after the corn is "laid by." Comparing the corn-field ratios of birds with the winter averages for all habitats we find them only half as large in northern Illinois (211 in corn to 420 for the whole area), a little larger in central Illinois (482 to 440) and 65 per cent. larger in southern Illinois (1384 to 836). The high ratio in *southern Illinois* corn fields was mainly due to flocks of juncos, ranging in number of birds from 3 to 24, only 4 of the 133 corn-field juncos recorded having been single birds; to equally large flocks of meadow-larks in corn fields (3 to 36 in numbers, only 2 of 134 of these birds having been seen singly), and to one flock of 74 mourning doves. Next to these dominant species came quails in two covies of 18 and 27 each, crows, solitary or only 2 to 5 together, red-headed woodpeckers, single of course, and tree sparrows in one flock of 8 but otherwise scattered.

In *central Illinois* the crow was the dominant species in our corn field records, mainly however, by reason of two large flocks, one of 44 and another with an estimated number of 400.* The next in order of prominence was the English sparrow, but with a number per square mile only half the general winter average of the species for the state (41 to 81). An interesting minor item is the occurrence of twenty cardinals in corn, a much larger number than in any other central Illinois situation, and nearly twice as large as was found in the corn fields of southern Illinois.

In the *northern* part of the state the leading species were the Lapland longspur, mainly 2 to 4 in a place but with one flock of 38, and a flock of 55 goldfinches.

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* These were seen December 18 in fields which were probably not yet husked, and the crows were very likely helping themselves to corn kernels from the tips of the ears. To the larger grain-eating birds, husked and unhusked corn fields are of course very different habitats, but unfortunately our field notes contain no records of this distinction.

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS IN CORN

Species	Southern	Central	Northern	State
Quail	75	13	0	16
Prairie chicken	0	0	18	7
Mourning dove	220	*	6	31
Flicker	50	0	0	6
Crow	39	341	28	183
Meadowlark	373	0	0	48
English sparrow	0	41	12	25
Goldfinch	8	0	54	22
Lapland longspur	0	0	61	23
Tree sparrow	33	24	17	23
Junco	370	29	0	61
Total	1168	448	196	445

* Present, but in trivial number.

Our sectional data for *wheat* are greatly distorted by flocks of Lapland longspurs in northern Illinois, bringing the general average in wheat fields there to twice that for the southern and four times that for the central section. These birds were in three flocks of 9, 13, and 175, respectively. The prairie horned lark was the only other species especially abundant in northern Illinois wheat fields, where it averaged 317 to the square mile, a ratio mainly due, however, to a single flock. The wheat fields of central Illinois were nearly destitute of birds, the leading species there being juncos, found but three times, in numbers from 1 to 9, and the tree sparrows, found but once, in a flock of 5. In southern Illinois, on nearly half a section of wheat, only 59 birds were to be found, juncos in the largest number (31 to the square mile) and next these the prairie horned larks, meadowlarks, and bluebirds, each in about two-thirds the above average.

In the table next following, gross irregularities of the sectional lists are smoothed down somewhat in the column of averages for the state as a whole, but they are still too large to have much if any value as statistics. They show what was actually found by a limited number of observations in one winter, but warrant no inference that they would be duplicated in any similar area in another.

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS IN WHEAT

Species	Southern	Central	Northern	State
Prairie horned lark	24	5	317	52
Crow	0	7	33	7
Meadowlark	24	*	0	11
Lapland longspur	0	0	2366	291
Tree sparrow	0	12	0	5
Slate-colored junco	31	32	0	28
Cardinal	0	5	0	2
Bluebird	22	0	0	10
Total	101	61	2716	406

The record for fields of *stubble* is quite as irregular as that for wheat, quails and meadowlarks dominating in southern Illinois, prairie horned larks in central, crows and Lapland longspurs in northern, and the last of these in the state as a whole, with prairie horned larks and crows next in order. An interesting item is the occurrence in southern Illinois of sufficient numbers of song sparrows and bluebirds to bring these species into the "more abundant" list.

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS IN STUBBLE

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Quail	142	19	8	40
Prairie horned lark	79	131	31	83
Crow	8	52	119	69
Meadowlark	158	*	0	33
English sparrow	0	34	*	15
Lapland longspur	0	0	335	127
Tree sparrow	36	6	13	14
Song sparrow	24	0	0	5
Bluebird	24	0	0	5
Total	471	242	506	391

* Present in only trivial numbers.

On *plowed ground*, the most striking feature was the dominance of the prairie horned lark in central Illinois—211 to the square mile on the 325 acres of that habitat. Over four-fifths of these birds were in two flocks of 37 and 48 respectively, the remainder occurring in scattered small numbers. The other important averages were 55 juncos and 33 English sparrows to the square mile in central Illinois. Only three birds were found on eighteen acres of southern Illinois plowed land, while on 223 acres in northern Illinois there were approximately equal numbers of prairie horned larks and Lapland longspurs, with about half as many English sparrows. The leading species for the state as a whole (really only central and northern Illinois, since the southern acreage of plowed ground was very small), were the prairie horned lark with 130 to the square mile, junco with 32, and English sparrow with 24.

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS ON PLOWED GROUND

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Prairie horned lark	0	211	23	130
Crow	0	0	*	*
English sparrow	0	33	11	24
Lapland longspur	0	*	20	10
Slate-colored junco	0	55	0	32
Undetermined	0	0	20	8
Total	0	299	74	204

* Trivial numbers only.

The winter data of our *pasture* area of nearly 500 acres are especially interesting and much more satisfactory than those just discussed, the only important irregularity being excessive numbers of prairie horned larks (186 to the square mile in central Illinois as compared with northern and southern, which are 14 and 80 respectively). It is true that the tree sparrows were more abundant to the northward and juncos to the southward, but this is consistent with the winter distribution of the species, the juncos going as far to the south as the Gulf States and the tree sparrows tending to linger in the latitude of Kentucky and the Carolinas. Otherwise the numbers of the more abundant species are fairly similar in central and northern Illinois, only the chickadee being notably commoner in the northern section. That quails, flickers, meadowlarks, purple finches, cardinals, and bluebirds should be much the most numerous in southern Illinois pastures was to be expected for various reasons—the greater abundance of birds in general to the southward, the usual avoidance of rigorous winter weather by meadowlarks, cardinals, and bluebirds, the much larger area in forests in southern Illinois, and the more abundant ground-cover of kinds sought by the quail.

For the state as a whole, we found birds of the winter pasture prominent in about the following order: goldfinch, prairie horned lark, English sparrow, junco, crow, tree sparrow, purple finch, chickadee, meadowlark, quail, and bluebird, in averages ranging from 133 to the square mile for the first to 8 for the last of this series.

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS IN PASTURES

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Quail	56	0	0	9
Turkey vulture	21	0	0	3
Flicker	21	7	0	6
Prairie horned lark	80	186	14	97
Crow	14	22	36	27
Meadowlark	59	0	0	9
Purple finch	108	0	0	16
English sparrow	0	45	40	36
Goldfinch	0	167	149	133
Tree sparrow	7	5	55	27
Slate-colored junco	87	41	0	31
Cardinal	14	10	0	7
Chickadee	0	6	21	11
Bluebird	45	0	*	8
Total	512	489	315	420

* Only trivial numbers.

Meadows differ from pastures in our winter record in the smaller number of birds per square mile (319 as compared with 446); in the smaller number also of the more abundant species (6 and 10 respectively)

necessary to make up the 85 per cent. list; and in the much greater irregularity of numbers per square mile in the different sections and habitats. Meadows seem, in short, from our data to be a much less attractive situation for birds than pastures in winter as well as in summer, most of those found there being wandering flocks of gregarious species. The contrast was especially strong in southern Illinois, where the more abundant list contained three species in meadows and eleven in pastures. The inadequacy of our data for meadows is especially shown, however, by the numbers in central Illinois, where, with a meadow acreage two-thirds that of northern Illinois, the number of birds per square mile was less than a fifth as large, a fact of which we can offer no plausible explanation except that the data of our record are too few to give us fair averages where the birds are so largely gregarious.*

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS IN MEADOWS

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Quail	122	0	0	19*
Prairie horned lark	14	23	6	13*
Blue jay	0	10	0	3
Crow	0	6	40	23*
Meadowlark	340	0	0	54*
Lapland longspur	0	0	332	169*
Tree sparrow	0	10	6	6*
Slate-colored junco	0	10	0	3
Total	476	59	384	290

* The figures starred make up 85 per cent of the total number of winter birds in Illinois meadows.

The southern Illinois area of 22¼ acres of *swamp* brought under observation yielded 42 birds of eleven species, of which three, however, were hawks and one a turkey vulture. The others, excepting a single bluebird, were all distinctively woodland species. The acreage is so small that the frequency figures have but little value.

Our *woodland* area of 317 acres, two-thirds of which is in southern Illinois, was well stocked with birds for the winter season—1591 of them to the square mile in southern, 679 in central, and 447 in northern Illinois. The general state average per square mile was 1239, representing thirty-one species, twenty-nine of which are in the southern Illinois list, eleven in the central, and ten in the northern. The commonest species was the junco, the next the blue jay, the next the turkey vulture, and then the tufted titmouse, all prominent on the state list because of their dominance in southern Illinois. Seven of the 87 per cent. woodland list were, in fact, seen in southern Illinois only, namely, the quail, turkey

* For a discussion of gregarious and solitary species, see Article 6, Volume XIV, already cited.

vulture, purple finch, junco, song sparrow, Carolina chickadee, and bluebird. The tufted titmouse, occurring there at an average of 131 to the square mile, was noticed in woodlands elsewhere only once. The prominence of the goldfinch in the central Illinois list, (287 to the square mile), with only one record additional, is deceptive, being due to a single flock. Indeed, the actual numbers of birds seen in the woods of central and northern Illinois are so small (48 and 35 respectively) that the species ratios there have little meaning.

NUMBERS PER SQUARE MILE OF THE PRINCIPAL WINTER BIRDS IN WOODS

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Quail	70	0	0	47
Turkey vulture	156	0	0	105
Downy woodpecker	27	*	66	29
Blue jay	162	13	11	113
Crow	37	118	164	74
Purple finch	40	0	0	27
Goldfinch	*	287	0	47
Tree sparrow	28	0	44	27
Slate-colored junco	431	0	0	289
Song sparrow	12	0	0	8
Cardinal	61	52	0	49
White-breasted nuthatch	12	105	33	37
Tufted titmouse	131	*	0	90
Chickadee	0	39	66	19
Carolina chickadee	110	0	0	74
Bluebird	107	0	0	72
Total	1384	614	384	1107

* Number negligible.

The winter *orchard* area of thirty-eight acres was also too small for any but a few hints of general tendencies, that of northern Illinois being, in fact, quite negligible. Eighty birds of thirteen species were recorded from orchards, 65 of them (eleven species) being from southern Illinois, and 14 (five species) from central. Only the southern list has any special significance, and here juncos make up more than half the total number. Purple finches, field sparrows, and Carolina chickadees, next in order, were all seen the same number of times, and English sparrows and cardinals nearly as often. The general southern Illinois winter average was 2187 birds to the square mile of orchards, and of this number 1245 were juncos. The species were essentially those of the woodlands, only the English sparrow being reported from the orchard and not from the forest.

As is to be expected in winter when shelter is a prime necessity, our sixty-three acres of *shrubbery* contained more birds to the square mile

than any other habitat—2139 for the state at large and 2008 for southern Illinois, in which more than half of our shrubbery area was found. The central Illinois data are comparatively worthless because two flocks of English sparrows and chickadees respectively contained 73 of the 80 birds noted in the shrubbery of that section. English sparrows and quail numbered nearly half of all the birds of the state list in shrubbery, and the other more abundant species were chickadees, juncos, and blue jays, these five taken together making 82 per cent of all the shrubbery birds, leaving but 18 per cent for the other twelve species of the complete list. The special southern Illinois list—one made up, that is, of birds not seen in shrubbery farther north—comprises the quail, red-bellied woodpecker, purple finch, tree sparrow, junco, song sparrow, fox sparrow, tufted titmouse, Carolina chickadee, and bluebird—10 species out of 17 for the whole state.

NUMBERS PER SQUARE MILE OF ALL WINTER BIRDS FOUND IN SHRUBBERY

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Quail	715	0	0	377*
Hairy woodpecker	0	0	71	20
Downy woodpecker	19	55	71	41
Red-bellied woodpecker	19	0	0	10
Blue jay	0	165	429	155*
Purple finch	174	0	0	93*
English sparrow	271	2744	0	653*
Tree sparrow	58	0	0	31
Slate-colored junco	464	0	0	248*
Song sparrow	38	0	0	20
Fox sparrow	58	0	0	31
Cardinal	19	55	0	20
White-breasted nut-hatch	19	109	35	41
Tufted titmouse	38	0	0	20
Chickadee	0	1262	284	317*
Carolina chickadee	58	0	0	31
Bluebird	58	0	0	31
Total	2008	4390	890	2139

* The numbers starred make up 86 per cent of the total number of shrubbery birds in the state at large.

On our 250 acres of *waste and fallow* lands, 395 birds, representing nineteen species, were found,—equivalent to 1012 to the square mile. Much the most numerous of these were the gregarious tree sparrows and juncos, the latter about two-thirds as abundant as the former, (224 and 364 to the square mile respectively), the two together making 58 per cent. of the whole number of birds. All but one of the nineteen species were represented in the southern Illinois list as against 7 and 8

in central and northern Illinois or 10 in both sections together, leaving 9 species seen in southern Illinois and not farther north. Most of these, however, are usually to be found in central and northern Illinois in winter, but no doubt in smaller numbers than in the southern part of the state. As usual, the southern Illinois bird fauna was not only more diversified than the northern, but the leading species were each represented by a smaller number of birds. While three northern Illinois species were sufficient to make up 85 per cent of the whole number in that section and two central Illinois species were more than enough, eight were needed in southern Illinois—namely, the junco, quail, tree sparrow, song sparrow, blue jay, and cardinal and either the prairie horned lark, meadowlark, or bluebird.

NUMBERS PER SQUARE MILE OF ALL WINTER BIRDS IN WASTE AND FALLOW LANDS

Species	Southern Illinois	Central Illinois	Northern Illinois	State
Quail	127	199	72	115*
Red-tailed hawk	5	0	0	3
Hairy woodpecker	5	0	0	3
Downy woodpecker	17	36	7	15
Red-bellied woodpecker	11	0	0	6
Flicker	11	0	0	6
Prairie horned lark	22	0	0	12
Blue jay	88	0	13	46*
Crow	11	0	216	90*
Meadowlark	22	0	0	12
Tree sparrow	99	1121	405	364*
Slate-colored junco	225	470	70	224*
Song sparrow	99	54	13	60*
Swamp sparrow	5	0	0	3
Cardinal	66	72	0	48
White-breasted nut-hatch	5	0	0	3
Tufted titmouse	17	36	0	13
Chickadee	0	0	39	15
Bluebird	22	0	0	10
Unrecognized	0	0	0	6
Total	857	1988	835	1054

* The numbers starred make up 85% of the entire number.

Our data for *yards and gardens* in winter call for bare mention only. On five northern Illinois patches so classed, amounting to 5¾ acres, the only birds were two chickadees, and these were in a hedge beside a barnyard and not in the yard itself. In 5½ acres of central Illinois and 8¼of southern, English sparrows, in numbers averaging about a dozen to the acre, were the only birds seen. A comparison of these numbers with those of the sparrow in other situations indicates that even in winter *Passer domesticus* is almost wholly a domestic species—3938 to

the square mile in the yards and gardens of the whole state in winter as compared with 653 to the square mile in shrubbery and 42 to the same area for the state as a whole.

The Spring Migration Period

The Birds of March, April, and May, 1907

The spring birds of each section of the state are divisible into permanent resident species, representatives of which remain in that section the year round; winter residents lingering for a time in the lap of spring; summer residents gradually arriving from the south; and migrant species which pass beyond the section to their breeding grounds farther north. As everything is in a state of flux from the beginning to the end of spring, and as the currents of bird life flowing northward are strongly influenced by highly variable local and temporary conditions, those of the weather especially, the product of our survey is like a moving picture rather than a stationary scene, and we can have no assurance that any feature of it will be definitely reproduced in any other year. A single season's record is, in its details, one sample only of many courses of events which may run through the same season of successive years; but even a single sample is doubtless to be preferred to none.

The state was incompletely covered in the spring of 1907 by four trips: one across its northern end from Waukegan to Scales Mound (March 2 to 15); two in central Illinois, from Bloomington to Champaign (March 19 to 21) and from Danville to Warsaw and thence back by a more southerly route (April 19 to May 31); and one along the eastern border from Harvey in Cook county to Brownsville in White county (March 26 to April 11). The whole distance thus traveled was 442.8 miles, and the birds were recognized and counted on areas amounting to 7858 acres, of which 1875 were in northern Illinois, 3923 in central, and 2060 along the eastern border. The central Illinois area was thus about equal to the two others taken together. The total of 7276 birds counted and listed belonged to 117 species, 23 of which were found on the first or northern trip, 108 on the two central Illinois trips, and 68 on the trips along the eastern border. Five of the northern Illinois species, 33 of the central section, and 21 of the eastern, contributed 85 per cent. of the total number of birds from their respective parts of the state. The numbers per square mile were 341 for northern, 547 for central, and 859 for eastern Illinois, with 593 to the square mile as an average for the whole area.

If we arrange the numbers of birds per square mile in the order of the successive dates of the four trips, we find them increasing rapidly from March 2 to April 5, but falling off in the period from April 20 to May 29 to approximately the same number as that for March 19 to 21. This may be taken as evidence of an increasing local density of the bird population as the wave of the spring migration proceeded north-

ward, birds from the south coming in more rapidly than winter residents left for the north, until about the middle of April, at which time the crest of the wave had passed on, to be followed by a downward slope in its rear as the winter residents hastened their departure and dwindling numbers of the latest migrants and the summer residents came in.

BIRDS PER SQUARE MILE IN SUCCESSIVE NORTHERN AND CENTRAL ILLINOIS TRIPS, SPRING OF 1907

March 2 to 15, Northern Illinois	394
March 19 to 21, Central Illinois	543
March 29 to April 5, Central Illinois	790
April 20 to May 29, Central Illinois	549

The details of the migration movement can best be shown by taking up the separate trips in order, and dividing the eastern Illinois trip from north to south into three sections corresponding to our usual divisions of the state. So proceeding, we shall have two sets of data for northern Illinois, three for central, and one for southern, the areas covered in these sections being respectively 2215, 5055, and 588 acres.

The most abundant species in northern Illinois at the time of the trip from Waukegan in Lake county to Scales Mound in Jo Daviess county (March 2-15) were the English sparrow, Lapland longspur, crow, prairie horned lark, and prairie hen, these together making up 85 per cent. of the whole number of birds. This is essentially a *winter list* to which small numbers of tree sparrows, juncos, and both varieties of horned larks may be added, together with woodpeckers, nuthatches, and an occasional hawk. The *spring migration* was represented by a few meadowlarks, rusty blackbirds, bronzed grackles, red-headed woodpeckers, bluebirds, robins, and mourning doves and a single song sparrow.

THE MOST ABUNDANT BIRDS (85 PER CENT. LIST), WAUKEGAN TO SCALES MOUND, MARCH 2 TO 15, 1907

Species	No. of each	Ratio to total No.
English sparrow	475	41.2
Lapland longspur	188	16.3
Crow	151	13.1
Prairie horned lark	131	11.4
Prairie hen	42	3.6

All birds per square mile, 394.

Of the 1107 birds recognized, 846, or 77 per cent., belonged to species classed as permanent residents, 218, or 19.7 per cent. were winter residents, 3.3 per cent. were summer residents, recently arrived from the south, and 5 (rusty blackbirds), or less than one-half per cent., were migrants. The spring infiltration thus amounted to less than four

per cent. of the whole number identified. The English sparrows were much the most abundant, their number amounting to nearly 43 per cent. of all the birds seen on the trip across the northern end of the state. The prairie hen was represented by 42 birds, equal to 3.6 per cent. of the whole number listed.

RESIDENCE CLASSIFICATION, WAUKEGAN TO SCALES MOUND, MARCH 2–15, 1907

NUMBER AND PER CENT OF SPECIES

	Permanent	*Winter*	*Summer*	*Migrant*	*All*
Number	11	4	8	1	24
Per cent.	45.8	16.7	33.3	4.2	100

NUMBER AND PER CENT OF ALL BIRDS

	Permanent	*Winter*	*Summer*	*Migrant*	*All*
Number	846	218	38	5	1107
Per cent.	76.4	19.7	3.3	0.6	100

NUMBER AND PER CENT OF NATIVES

	Permanent	*Winter*	*Summer*	*Migrant*	*All*
Number	371	218	38	5	632
Per cent.	58.7	34.5	6.0	0.8	100

That the spring migration movement was in progress in extreme northern Illinois during this first half of March, 1907, may be seen by comparison of the *species ratios* of the residence classes of March 2-15 with those of January 2-16 as follows:

RATIOS OF SPECIES, NORTHERN ILLINOIS, WINTER AND SPRING

	Permanent	*Winter*	*Summer*	*Migrant*
January 2–16	57.2	19.0	19.0	4.8
March 2–15	45.8	16.7	33.3	4.2

The sum of the ratios of permanent and winter resident species for the spring period is less by 14 than that for the winter period, and the summer resident species ratio is greater by the same amount. A comparison of the *numbers of native birds* in the several classes, gives much the same result, although the differences are less conspicuous. The permanent and winter total for January exceeds that for March by 5.2, and the summer and migrant total falls short the same number.

RATIOS OF NATIVE BIRDS, NORTHERN ILLINOIS, WINTER AND SPRING, 1907

	Permanent	*Winter*	*Summer*	*Migrant*
January 2–16	61.4	37.0	1.3	0.3
March 2–15	58.7	34.5	6.0	0.8

From the foregoing statements, we may infer that certain species of permanent and winter residence had lost in the early spring so many of their numbers to the north that representatives of them were not found on the March trip across the northern end of the state, but that

other species of these classes had received accessions from the south in larger number than their losses by the northward movement.

The bird list of the short trip from Bloomington to Champaign (March 19-21) gave further evidence of the advent of spring in the addition of the red-winged blackbird to the list of summer residents, and the number of species necessary to make up the 85 per cent. list was also increased from five to fourteen. The prairie horned lark, rusty blackbird, junco, and meadowlark made up about half the total number, juncos and tree sparrows remaining to represent the winter residents. Much more definite evidence of the increased effect of spring conditions is given by the ratios of the several residence classes as compared with those just given. Against 3.3 per cent of summer residents and less than 1 per cent of migrants for the first half of March in northern Illinois, we now have 30.9 per cent. of summer residents and 14.4 per cent. of migrants during the second half of the month in central Illinois, while the winter residents remaining were 19.7 per cent. northern and 16.6 per cent. central. The ratio of spring arrivals (summer residents and migrants) on the central Illinois list was thus more than ten times that of the slightly earlier northern Illinois list, the ratio of winter residents being at the same time less than a sixth smaller—another illustration of the fact previously referred to that birds from the south come up in the spring migration earlier and in much larger numbers than those of the northern birds which are leaving for their summer homes, with the result that a wave of condensation rolls northward, to be followed presently, like any other wave, by a "trough" of diminished numbers.

RESIDENCE RATIOS, NUMBERS OF BIRDS

	Permanent	*Winter*	*Summer*	*Migrant*
Northern Illinois, March 2–15	76.4	19.7	3.3	0.6
Central Illinois, March 19–21	38.1	16.6	30.9	14.4

THE MOST ABUNDANT BIRDS (85 PER CENT. LIST), BLOOMINGTON TO CHAMPAIGN, MARCH 19 TO 21, 1907

Species	No. of each	Ratio to total No.
Prairie horned lark	82	14.
Rusty blackbird	75	12.8
Junco	67	11.5
Meadowlark	57	9.8
English sparrow	32	5.5
Bronzed grackle	28	4.8
Crow	25	4.3
Bluebird	25	4.3
Tree sparrow	24	4.1
Red-winged blackbird	22	3.8
Song sparrow	19	3.3
Flicker	17	2.9
Robin	14	2.4
Prairie hen	13	2.2

All birds per square mile, 543.

If we divide the eastern Illinois trip (113.4 miles) into three sections corresponding to the divisions of the state, we find that in the northern Illinois section from Harvey to Grant Park, (March 26 to 28), three of the most abundant species (Lapland longspur, English sparrow, and prairie horned lark) were winter birds which together made up about 54 per cent of the 559 birds seen, and that the Lapland longspur stands at the head of the list. Other winter species still lingering in small numbers were the junco, Smith's longspur, and tree sparrow, but a much larger number of the following species, mentioned herein in a diminishing order of numbers, had already come up from the south, viz., meadowlark, Wilson's snipe, rusty blackbird, Canada goose, bronzed grackle, robin, red-winged blackbird, vesper sparrow, migrant shrike, killdeer, cowbird, pintail duck, and phoebe.

It has often been noticed that birds in migration concentrate at the southern end of Lake Michigan, passing thence northward along the western shore as by a high road, and an unusual number of birds were found in this northern section of eighteen miles. These were mainly a flock of thirty-two Canada geese seen in a muddy pond in a plowed field, several small flocks of Wilson's snipe, and large numbers of Lapland longspurs still remaining, and of meadowlarks, prairie horned larks, and rusty blackbirds, all of which taken together made up 731 of the 1061 birds to the square mile recorded from this northern section of the trip.

Of the 24 species recognized, 14 were summer residents, 2 were migrants, 5 were permanent residents, and only 3 were winter residents; or, taking account of the actual numbers of birds seen, 32 per cent were summer residents, 34 per cent were winter residents, 27 per cent were permanent residents, and 7 per cent were migrants.

RESIDENCE CLASSIFICAION OF SPECIES, NORTHERN ILLINOIS, HARVEY TO GRANT PARK

MARCH 26 TO 28, 1907, EASTERN ILLINOIS TRIP

Species	*Permanent*	*Winter*	*Summer*	*Migrants*	*All*
Numbers	5	3	14	2	24
Per cent.	20.8	12.5	58.3	8.4	100

NUMBERS AND PER CENTS OF ALL BIRDS

Numbers	150	190	179	40	559
Per cent.	26.8	34.0	32.0	7.2	100

NUMBERS AND PER CENTS OF NATIVE BIRDS

Numbers	83	190	179	40	492
Per cent.	16.9	38.6	36.4	8.1	100

NUMBERS OF THE MORE ABUNDANT SPECIES, HARVEY TO GRANT PARK, MARCH 26 TO 28, 1907

	No. of each	Ratio to total No.
Lapland longspur	182	32%
English sparrow	67	12
Meadowlark	51	9
Prairie horned lark	46	9
Wilson's snipe	45	9
Canada goose	32	6
Rusty blackbird	32	6
Bronzed grackle	14	2
Prairie hen	13	2

All birds, 1061 to the square mile.

In the central Illinois division, (March 29 to April 5) the number of birds to the square mile (719) was only 70 per cent that in the northern division, although the number of species was more than twice as large (54 for central and 24 for northern). Of winter residents there still remained the Lapland longspur, tree sparrow, junco, and golden-crowned kinglet, which taken together made less than 10 per cent of the birds of the area. The summer birds had already come to predominate in this transition period, and the total number of birds per square mile recorded on this central Illinois trip (719) was much above the average of this region for the winter season, (440), and greater even than the July average (650) of the same year. If, however, we take into consideration the permanent and summer residents only, we see that the summer population had not yet arrived in full strength, the total number averaging only 445 to the square mile. The crest of the spring wave already referred to was thus made up of all four of the residence classes in the ratio of 23% of permanent residents, 9% of winter residents, 30% of migrants and 38% of summer residents. If we omit the English sparrows, the corresponding residence ratios are permanent 17%, winter 10%, summer 41%, and migrant 33%.

RESIDENCE CLASSIFICATION, CENTRAL ILLINOIS, SPRING, MARCH 29—APRIL 5, WATSEKA TO FLAT ROCK, EASTERN ILLINOIS (CENTRAL)

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
NUMBERS AND PER CENTS OF SPECIES					
Numbers	19	4	20	11	54
Per cent.	35.2	7.4	37.0	20.4	100
NUMBERS AND PER CENTS OF ALL BIRDS					
Numbers	289	115	489	392	1294
Per cent.	23.0	8.9	37.8	30.3	100

NUMBERS AND PER CENTS OF NATIVE BIRDS

Numbers	207	115	489	392	1203
Per cent.	17.2	9.6	40.6	32.6	100

NUMBERS OF THE MORE ABUNDANT BIRDS, WATSEKA TO FLAT ROCK, MARCH 29 TO APRIL 5, 1907

	No. of each	Ratio to total No.
Meadowlark	175	13.6
Buff-breasted sandpiper	170	13.2
Smith's longspur	96	7.4
English sparrow	91	7.0
Pipit	82	6.3
Field sparrow	78	....
Bluebird	68	5.3
Vesper sparrow	58	4.5
Lapland longspur	55	4.3
Junco	52	4.0
Flicker	48	3.7
Prairie horned lark	39	3.0
Mourning dove	28	2.2
Robin	22	1.7
Crow	21	1.6
Cowbird	20	1.5
Crow blackbird	15	1.2
Savannah sparrow	15	1.2
All birds per square mile	719	

Turning now to the southern Illinois division (April 6 to 11) of the eastern Illinois trip, we find that although the number of species recorded was the same as for central Illinois, the effect of a lower latitude and slightly later date is shown in a number of birds, (1004 to the square mile), 37 per cent larger than that of the central Illinois list of the week before, and materially larger than that of the summer seasons of 1907 and 1909 (925 to the square mile). The principal winter species remaining were the savannah sparrow and juncos, and there was also a sprinkling of tree sparrows, golden-crowned kinglets, and four other species to be clasesd as winter birds in southern Illinois, the total number of this class amounting to 12 per cent of all the birds seen. 5.7 per cent were of migrant species, of which the pipit was much the most abundant, but about four-fifths of these April birds were permanent or summer residents, 65.5 per cent of the first and 15.7 per cent of the second. The ratio of permanent residents was nearly as large as in the dead of winter (see p. 403) and the 31 per cent of winter residents of that season were now represented by 12 per cent., the remainder being replaced by migrants and summer residents.

RESIDENCE CLASSIFICATION, SOUTHERN ILLINOIS, LAWRENCEVILLE TO BROWNSVILLE, APRIL 6–11, 1907

NUMBERS AND PER CENTS OF SPECIES

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	28	8	10	8	54
Per cent.	51.9	14.8	18.5	14.8	100.0

NUMBERS AND PER CENTS OF ALL BIRDS

Numbers	601	109	140	52	902
Per cent.	66.6	12.1	15.5	5.8	100.0

NUMBERS AND PER CENTS OF NATIVES

Numbers	571	109	140	52	872
Per cent.	65.5	12.5	16.0	6.0	100.0

NUMBERS OF THE MORE ABUNDANT BIRDS, LAWRENCEVILLE TO BROWNSVILLE, APRIL 6 TO 11, 1907

	No. of each	Ratio to total No.
Meadowlark	124	13.4
Bronzed grackle	87	9.4
Field sparrow	72	7.8
Quail	65	7.0
Cowbird	64	6.9
Savannah sparrow	63	6.8
Mourning dove	51	5.5
Vesper sparrow	37	4.0
Pipit	32	3.5
Junco	31	3.4
English sparrow	30	3.3
Robin	26	2.8
Flicker	22	2.4
Goldfinch	20	2.2
Blue jay	16	1.7
Bluebird	15	1.6
Cardinal	14	1.5
Towhee	12	1.3
Crow	11	1.2
Tufted titmouse	10	1.1
		85% = 785
All birds to the square mile	1007	

The fourth and longest trip of the spring of 1907, made April 20 to May 29, crossed the state from Danville to Warsaw by way of Clinton, Havana, Burnside, and Hamilton, and dropped back thence by rail to Lincoln, whence it returned to Danville by Clinton and Urbana, with an excursion from this last point south to Tuscola. The distance traveled was 180.6 miles and the area covered was 3235.17 acres, from which record was made of 2773 birds (549 to the square mile) belonging to 97 species. Eighty-three per cent. of the acreage was in oats (22.6 per cent.), plowed ground (21.7 per cent.), corn (20.6 per cent.), and

pasture (18.1 per cent.), the remainder being in wheat, stubble, meadows, woods, and waste land, with very small tracts of shrubbery, orchards, and farmyards.

Twenty-nine of the species of birds gave us 85 per cent. of the whole number, an average of 81 birds to the species, the remaining 68 species averaging only 6 birds each. A third of all the birds belonged, in fact, to four species, the English sparrow, bronzed grackle, meadowlark, and prairie horned lark; and if to these we add three more, the golden plover, robin, and cowbird, we have nearly half the whole number. Eighteen Smith's longspurs and 23 juncos were the only representatives of the winter-resident group found still lingering in central Illinois, the juncos seen April 23 and 26 and the longspurs May 1. Twenty of the 97 species noted were migrants on their way to points beyond our area, leaving 75 species normal to the summer season in central Illinois. Stated in numbers of birds, 0.9 per cent of those seen on these forty days of late April and May were winter residents, 14.5 per cent. were migrants, and 84.6 per cent. were summer birds, including permanent residents.

RESIDENCE CLASSIFICATION, SPRING 1907, APRIL 20—MAY 29, CENTRAL ILLINOIS

NUMBERS AND PER CENTS OF SPECIES

	Permanent	*Winter*	*Summer*	*Migrant*	*All*
Numbers	16	1	54	25	96
Per cent.	16.7	1.0	56.3	26.0	100

NUMBERS AND PER CENTS OF ALL BIRDS

	Permanent	*Winter*	*Summer*	*Migrant*	*All*
Numbers	803	23	1464	389	2679
Per cent.	30.1	0.9	54.5	14.5	100

NUMBERS OF NATIVE BIRDS AND PER CENTS

	Permanent	*Winter*	*Summer*	*Migrant*	*All*
Numbers	537	23	1464	389	2413
Per cent.	22.3	0.9	60.7	16.1	100

That spring was now nearly merged in summer is further shown by a comparison of the present 85 per cent. list with the corresponding central Illinois list for July 1907, from which it appears that all the twelve birds of the latter list are among the first thirteen of the former. That the movement northward of these characteristic and dominant summer species was, however, far from complete seems probable from the fact that their total number averaged 553 to the square mile for July, 1907, and only 319 to the mile for April and May of the same year. But 58 per cent. of what we may call the final summer number of the birds of these species were on the ground by the end of May. Just what this difference may mean, however, it is impossible to say, since the summer average covers some of the young of the year, (of the number of which we have no record), as well as later accessions from the south.

Spring Birds in Habitats

The difficulty of determining the habitat preferences of a faunal group as sensitive to environmental conditions, as alert in readjutsment, and as capable of free and rapid locomotion as birds, is very great even in the comparatively stable summer season when their obligations to their young anchor them to their chosen breeding places; and it is many times multiplied when the period of their migration converts the semi-stagnant pool of bird life into a swirling stream whose very banks change and shift from day to day as the season advances. Our tabulated data of numbers per square mile in different habitats during the spring migration give us, therefore, little that is worthy of record. A few tentative generalizations may be made, however, from a comparison of numbers in the principal central Illinois habitats in April and May, 1907, with those of July of the same year. That the number of mourning doves in wheat should be 22 to the square mile in spring and 313 in July, and that the number of the most abundant birds per square mile of wheat shoud be 360 in spring and 837 in summer, can be readily understood as due to the food resources offered to birds in the fields of shocked grain.

Of the seven areas large enough to appear in our central Illinois averages of the late spring, pastures and meadows were much the most thickly populated (1091 and 1086 to the square mile respectively), and stubble field were next (877 to the mile), while corn, wheat, oats, and plowed ground were curiously similar in their averages to the square mile, (312, 363, 302, and 332). These last figures perhaps express the numbers attributable to a mere chance distribution of birds not yet settled for the summer season, and the large numbers for pastures and meadows may be taken as evidence of a choice of habitats most nearly like the original prairie of central Illinois. Their preponderance is further shown by the fact that it was true not only for birds in general but also for 14 of the 18 species on our most abundant list. Our woodland area of only 43½ acres is too small for satisfactory inference, especially as only eight of our 18 more abundant birds were found there; but these were numerous enough to give us an average of 1487 per square mile. Only three of them, however, were characteristically woodland species, and this average and also the even less dependable ones of still smaller tracts of orchards, shrubbery, and yards and gardens had probably best be ignored.

The Fall Migration Period

Our available data of the fall migration period were obtained in 1906 in central and southern Illinois only, in the former from August 29 to October 26 inclusive, and in the latter from October 31 to November 16. In central Illinois trips were made from Urbana past Danville to the Indiana line, August 29 to September 1, from Cham-

paign to Downs in McLean county, September 4 to 7, from Champaign across the state by way of Decatur and Jacksonville to Quincy on the Mississippi River, September 17 to October 17, and for short distances about Urbana, September 12 to 15 and October 23 to 26. In southern Illinois a single trip was made from Cairo northward to Pana. The area surveyed in these periods was 5,890.58 acres, of which 70 per cent. was in central Illinois. On this entire area 9,387 birds were recognized and counted (1020 to the square mile), 5.408 of them in central Illinois, and 3,979 in southern. The number per square mile in central Illinois was only two-thirds of that in southern (883 to 1467), a difference at least partially attributable, no doubt, to the later period of the southern observations and the concentration there of birds in the act of migration.

The percents of permanent and winter resident *species*, taken together, were in early November about three times as large in southern Illinois as in central in September and October, and those of the summer and migrant species were about three times as large in central Illinois as in southern. In *numbers of native birds* the permanent and winter residents together were nearly twice as abundant south as north, and the summer residents and migrants were about twice as abundant north as south. The great predominance of English sparrows in central Illinois, as compared with southern, obscures the contrast in the numbers of the table of *all birds* by its over-weight of permanent residents in the central section.

RESIDENCE CLASSIFICATION, FALL, CENTRAL ILLINOIS, AUGUST 28 TO OCTOBER 26, 1906

NUMBERS AND PER CENTS OF SPECIES

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	21	6	51	24	102
Per cent.	20.6	5.9	50.0	23.5	100

NUMBERS AND PER CENTS OF ALL BIRDS

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	3367	270	2161	553	6351
Per cent.	53.0	4.3	34.0	8.7	100

NUMBERS AND PER CENTS OF NATIVE BIRDS

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	1 263	270	2161	553	4247
Per cent.	29.7	6.4	50.9	13.0	100

RESIDENCE CLASSIFICATION, FALL, SOUTHERN ILLINOIS, OCTOBER 31 TO NOVEMBER 16

NUMBERS AND PER CENTS OF SPECIES

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	32	9	8	7	56
Per cent.	57.2	16.1	14.2	12.5	100

NUMBERS AND PER CENTS OF ALL BIRDS

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	2034	875	936	124	3969
Per cent.	51.2	22.1	23.6	3.1	100

NUMBERS AND PER CENTS OF NATIVE BIRDS

	Permanent	*Winter*	*Summer*	*Migrants*	*All*
Numbers	1961	875	936	124	3896
Per cent.	50.3	22.5	24.0	3.2	100

RESIDENCE CLASSIFICATION RATIOS, FALL PERIOD, CENTRAL AND SOUTHERN ILLINOIS COMPARED

SPECIES

	Permanent	*Winter*	*Summer*	*Migrants*
Central Illinois	20.6	5.9	50.0	23.5
Southern Illinois	57.2	16.1	14.2	12.5

NUMBERS OF ALL BIRDS

Central Illinois	53.0	4.3	34.0	8.7
Southern Illinois	51.2	22.1	23.6	3.1

NUMBERS OF NATIVES

Central Illinois	29.7	6.4	50.9	13.0
Southern Illinois	50.3	22.5	24.0	3.2

The large ratios of permanent resident species and native birds in southern Illinois is of course attributable to the fact that many species of general summer distribution are driven by the cold from the northern sections into, but not beyond, the southern part of the state; and other differences are doubtless due in part to an advancement of the season by about six weeks when the southern Illinois observations were made.

The southward concentration already referred to is most clearly shown by a tabulation of species and numbers of the fall birds of central Illinois which were found also in southern Illinois in fall. Such a list comprised 48 native species, and the total number of birds of these species seen and counted in central Illinois was 3,919, and in southern Illinois 3.844,—equivalent to an average of 608 to the square mile for central and 1,392 for southern Illinois. That is, relatively late fall birds of southern Illinois were nearly 2⅓ times as abundant to the unit of area as the somewhat earlier birds of the central Illinois fall. The greater abundance of birds in southern Illinois in winter than in summer referred to on page 421 was thus already well marked in the latter part of the migration season.

The stage of migration covered by these observations can be told by comparing the numbers of birds of definitely transient species (that is summer residents and migrants) on the fall lists for central and southern Illinois respectively, which were found in both sections of the state. So doing, we find 11 such species in which central Illinois numbers per square mile exceeded those for southern Illinois and 19 in

which southern Illinois numbers exceeded the central Illinois. In the former group migration was at best only beginning when the central Illinois observations were made, but in the latter it was at least well under way and may have passed its climax at the time of the southern Illinois observations.

NATIVE SPECIES COMMON TO CENTRAL AND SOUTHERN ILLINOIS, FALL OF 1906

	Central	Southern**
Killdeer	70	6+
Quail	72	365*
Prairie chicken	12	19*
Mourning dove	207	30*
Turkey vulture	7	8+
Marsh hawk	3	1*
Red-tailed hawk	4	5*
Pigeon hawk	1	1+
Sparrow hawk	9	6+
Downy woodpecker	11	26*
Red-headed woodpecker	31	4+
Flicker	86	41*
Prairie horned lark	329	104*
Blue jay	71	38*
Crow	243	380*
Cowbird	365	6+
Red-winged blackbird	16	2+
Meadowlark	377	128+
Rusty blackbird	20	8+
Bronzed grackle	677	862+
Goldfinch	144	97*
Vesper sparrow	82	3+
Savannah sparrow	9	13+
Grasshopper sparrow	67	1+
Henslow's sparrow	2	1+
White-crowned sparrow	8	2+
White-throated sparrow	93	156+
Tree sparrow	10	20+
Chipping sparrow	4	5+
Field sparrow	84	58+
Slate-colored junco	238	624+
Song sparrow	30	85*
Lincoln's sparrow	6	1+
Swamp sparrow	157	46+
Fox sparrow	8	14+
Towhee	15	6+
Cardinal	3	42*
Migrant shrike	6	4*
Myrtle warbler	112	30+
Pipit	48	68+
Mockingbird	2	9+

* Not transient in central and southern Illinois.
\+ Transient in central and southern Illinois.
** To adjust these numbers for comparison, multiply those for southern Illinois by 2⅓.

NATIVE SPECIES COMMON TO CENTRAL AND SOUTHERN ILLINOIS, FALL OF 1906—*Concluded*

	Central	Southern**
Bewick's wren	1	1+
White-breasted nuthatch	2	2*
Tufted titmouse	10	16*
Carolina chickadee	7	33*
Golden-crowned kinglet	12	1+
Robin	87	393+
Bluebird	61	84+
	3919	3844
English Sparrow	2104	73

* Not transient in central and southern Illinois.
\+ Transient in central and southern Illinois.
** To adjust these numbers for comparison, multiply those for southern Illinois by 2⅛.

In the trip across the central part of Illinois, made August 28 to October 29, 6382 birds were seen and counted, 31 of them not recognized and the remainder belonging to 102 species. Seventeen of the more abundant kinds made up 85 per cent of the whole number, with an average of 321 birds to the species, the remaining 85 species averaging but 11 birds each. An enormous abundance of English sparrows, amounting to 38.6% of the whole number of birds seen and counted, reduces the number of native birds to 4278, 21 species of which, with an average of 204 birds, were on the 85% list, the remaining 80 species averaging 8 birds each.

Among the more obvious evidences of migration shown by the following table of the more abundant central Illinois species is the occurrence of considerable numbers of juncos, myrtle warblers, white-throated sparrows, and pipits, but the general composition of the list is still that of the summer birds.

NUMBERS OF THE MORE ABUNDANT BIRDS OF CENTRAL ILLINOIS, FALL OF 1906 (AUGUST 29 TO OCTOBER 26) 85% LIST

English sparrow	2104	Goldfinch	144
Bronzed grackle	677	Myrtle warbler	112
Meadowlark	377	White-throated sparrow	93
Cowbird	365	Robin	87
Prairie horned lark	329	Flicker	86
Crow	243	Field sparrow	84
Slate-colored junco	238	Vesper sparrow	82
Mourning dove	207	Quail	72
Swamp sparrow	157		

ADDITIONAL SPECIES, IF ENGLISH SPARROWS ARE ELIMINATED

Blue jay	71	Bluebird	61
Killdeer	70	Pipit	48
Grasshopper sparrow	67		

On the much smaller area of southern Illinois surveyed October 21 to November 16 (acreage for central Illinois 4623.7, for southern Illinois 1763.42), but 56 species were listed (3979 birds) the following 13 of which were needed to include 85% of the whole number.

NUMBERS OF THE MORE ABUNDANT BIRDS OF SOUTHERN ILLINOIS, FALL OF 1906 (OCTOBER 31 TO NOVEMBER 16) 85% LIST

Bronzed grackle	862	Prairie horned lark	104
Slate-colored junco	624	Goldfinch	97
Robin	393	Song sparrow	85
Crow	380	Bluebird	84
Quail	365	English sparrow	73
White-throated sparrow	156	Pipit	68
Meadowlark	128		

English sparrows, it will be seen, contributed less than 2% to the total. The 13 more abundant species averaged 263 each, and the remaining 43 species 13 each. The above list differs from that of central Illinois for September and October by the dropping of seven species and the addition of the song sparrow, and in the order of abundance of the numbers of birds the several species common to the lists, of course, differ widely. The most notable difference is in the numbers of the English sparrow, which drops from the head of the list in central Illinois to the next to the last place on that for southern Illinois. The junco, robin, and quail were especially more abundant southward, but the general composition of the two lists is fairly similar.

FALL BIRDS IN HABITATS

The relation of birds to special features of their environment during the migration period, characterized as this is by a breaking of the ties which have held the birds to their local habitats during summer or winter, is necessarily of relatively little moment except as it may tend to show a persistence of features of their habitat choices which even the abandonment of their previous homes in a search for new situations can not wholly dissolve. It may be, also, that the exigencies of migration involve different demands and hence different habitat resorts from those of a settled and relatively solitary life.

Certainly our tabulation of the numbers of birds per square mile in the several habitats of central Illinois in autumn gives color to this latter supposition. Among all the situations offered by the open fields, the pasture contained more than twice as many birds to the mile as any other, notwithstanding the fact that its total area was next to the largest on the list. Only corn surpassed it in area, and pastures contained two and a half times as many birds to the mile as corn.

ALL BIRDS IN HABITATS, FALL OF 1906, CENTRAL ILLINOIS

	Acreage	Nos. Birds	Birds per sq. mi.
Corn	1745.17	1617	593
Wheat	163.68	46	180
Stubble	952.87	573	385
Pasture	1198.47	2787	1490
Meadows	216.23	212	628
Plowed ground	166.61	171	657
Orchards	51.54	212	2633
Woods	11.48	22	1226
Shrubbery	10.60	63	3804
Yards and gardens	37.60	155	2638
Waste and fallow	65.45	462	4518
Miscellaneous	4.00	62	9920
Open fields	4443.03	5406	779
Woods, etc.	180.67	976	3457

On a fifth part of the area of pastures, meadows had less than half as many birds to the square mile, and plowed ground had nearly the same number per square mile as meadows. Young wheat, after the plant has started to grow, has evidently very little to offer the migrating bird, or to the fall resident, for that matter, but stubble fields doubtless offer some food. The especially striking feature of the situation is the very extraordinary number of birds found on all tracts covered by trees, shrubbery, and other rank vegetation like that of waste and fallow lands. Our areas of orchards, woods, shrubbery, yards and gardens, and wastes and fallows, are severally too small to have much meaning, notwithstanding a density of bird life in all ranging from 1226 to 4518 per square mile; but if we throw these tracts together into one fairly adequate total of 180.7 acres, we have an average density of 3457 birds to the square mile for the whole area as compared with 1490 for the very attractive pastures or 779 to the square mile for 4443 acres of open fields. Food in the pastures and both food and sheltered resting places in the other situations after the fatigues of their migration flights perhaps account for both these choices.

Our table of birds per square mile in fall in southern Illinois habitats is so distorted by the occurrence of large flocks of crows and blackbirds in corn, stubble, and woods that these must be eliminated to give us numbers comparable with those of central Illinois. This being done, we have in the two sections the same distinction between numbers of birds in the open fields and those in trees and shrubbery—that is woods, orchards, shrubbery, waste and fallow lands, and yards and gardens; the former averaging 621 birds per square mile on an area of 1439 acres and the latter averaging 2365 per square mile on a total of 401.5 acres. Wheat was in both sections visited by the smallest numbers of birds, but corn fields surpassed pastures in southern Illinois in the numbers resorting to them.

In corn fields, quails, crow blackbirds, and robins were the most abundant species; in wheat, only prairie horned larks were common enough to call for special mention; in stubble, blackbirds and crows were in a large majority; in pastures, only juncos were notably above the average; in meadows, meadowlarks, robins, and quail were the principal species; and those on plowed ground were juncos and prairie horned larks; in orchards, the junco greatly outnumbered all others; and in woods, robins, blackbirds, white-throated sparrows and juncos were the most abundant species—all data of observation, correct for the time and place, but furnishing, so far as we can see, no obvious warrant for generalization or prediction. Our fall habitat lists of central and southern Illinois have little resemblance, as was to be expected in view of the differences in climate, topography, and the date of observations made in the two sections.

ALL BIRDS IN HABITATS, FALL OF 1906, SOUTHERN ILLINOIS

	Acres	Nos. of birds	Birds per sq. mi.
Corn	301.46	573	1216
		(462)	(981)
Wheat	177.70	30	108
Stubble	178.98	1116	4000
		(195)	(697)
Pasture	301.23	309	657
Meadow	302.15	213	451
Plowed ground	87.85	101	736
Orchards	131.94	322	1562
Woods	84.19	842	6401
		(692)	(5266)
Shrubbery	18.54	45	1553
Yards and gardens	49.63	42	542
Waste and fallow	117.22	383	2091
Miscellaneous	12.53	3	153

NOTE: Figures in parenthesis are remainders after subtracting crows and bronzed grackles.

GENERAL SUMMARY OF THE MORE ABUNDANT BIRDS

We have repeatedly shown that relatively few species are represented in a single region or habitat by a sufficient number of birds to have any important effect, ecological or economic, and that more species consequently signify little or nothing in the system of life at the time and place; but in this connection account must be taken of the fact that species insignificant in one environment may be of primary importance in another and that a complete list of those important in some situation or relationship is needed to give an adequate idea of the significance of birds as a class. As a contribution to such a list of Illinois birds present

somewhere in really dominant numbers, we have made general tables of all the species which are on the "more abundant" lists of any section of the state in summer or in winter and of the more abundant species in any one of our thirteen habitats in either of these seasons. We have omitted from this tabulation the birds of spring and fall because of the brief periods of residence of many species and the extremely variable numbers of birds in any environment during the migration seasons.

Taking up first the geographical divisions, we find that of the 83 species of counted birds on our southern Illinois summer list, 22 were in our "more abundant" group and of the 41 winter species of that section, 14 were relatively abundant. The corresponding numbers of species for central Illinois were 68 and 13 respectively in summer and 27 and 6 respectively in winter, and for northern Illinois they were 95 and 15 in summer and 32 and 6 in winter. In our list for the state as a whole, we have 113 summer species on record of which 28 were classed as abundant, and 49 winter species 17 of which were abundant; that is, grouped geographically and seasonally from 16 to 35 per cent of our species fell in some one or more of our 85 per cent lists under these heads.

MORE ABUNDANT SUMMER AND WINTER BIRDS BY SECTIONS OF THE STATE

	Summer			*Winter*		
	S	C	N	S	C	N
Killdeer	X	—	—	—	—	—
Bob-white	X	—	—	X	—	—
Mourning dove	X	X	X	X	—	—
Turkey vulture	—	—	—	X	—	—
Red-headed woodpecker	X	X	—	—	—	—
Flicker	X	X	X	—	—	—
Kingbird	X	—	—	—	—	—
Prairie horned lark	—	X	X	X	X	X
Blue jay	X	—	—	X	—	—
American crow	—	X	X	—	X	X
Bobolink	—	—	X	—	—	—
Cowbird	X	X	—	—	—	—
Red-winged blackbird	X	X	X	—	—	—
Meadowlark	X	X	X	X	—	—
Orchard oriole	X	—	—	—	—	—
Bronzed grackle	X	X	X	—	—	—
Purple finch	—	—	—	X	—	—
American goldfinch	—	—	X	—	X	X
English sparrow	X	X	X	—	X	X
Lapland longspur	—	—	—	—	—	X
Vesper sparrow	—	—	X	—	—	—
Grasshopper sparrow	—	—	X	—	—	—
Lark sparrow	X	—	—	—	—	—
Tree sparrow	—	—	—	X	X	X
Field sparrow	X	—	—	—	—	—
Slate-colored junco	—	—	—	X	X	—
Song sparrow	—	—	—	X	—	—

MORE ABUNDANT SUMMER AND WINTER BIRDS BY SECTIONS OF THE STATE—*Concl'd*

	Summer			*Winter*		
	S	C	N	S	C	N
Cardinal	—	—	—	X	—	—
Indigo bunting	X	—	—	—	—	—
Dickcissel	X	X	X	—	—	—
Barn swallow	—	—	X	—	—	—
Maryland yellow-throat	X	—	—	—	—	—
Mockingbird	X	—	—	—	—	—
Brown thrasher	X	X	—	—	—	—
Tufted titmouse	—	—	—	X	—	—
Carolina chickadee	—	—	—	X	—	—
American robin	X	X	X	—	—	—
Bluebird	X	—	—	X	—	—
38 Species	22	13	15	14	6	6

Our habitat tables, on the other hand, show that of 113 summer species 48 were found on the 85 per cent list of one or more habitats and that of the 49 winter species 29 were on at least one of the 85 per cent. lists—ratios of 42 per cent. and 60 per cent. respectively.

NUMBERS AND RATIOS OF SPECIES OF MORE ABUNDANT BIRDS, BY SEASONS, SECTIONS, AND HABITATS

	Total number	85 per cent. list	Ratios per cent.
SOUTHERN ILLINOIS			
Summer	83	22	27
Winter	41	14	34
CENTRAL ILLINOIS			
Summer	68	13	18
Winter	27	6	22
NORTHERN ILLINOIS			
Summer	95	15	16
Winter	32	6	19
WHOLE STATE			
Summer	113	28	25
Winter	49	17	35
HABITAT RATIOS			
Summer	113	48	42
Winter	49	29	60

The total number of species counted and recorded on our two lists of seasons and habitats is 125 and the number on the corresponding two "more abundant" lists is 63; that is, 50 per cent. of these species were found sufficiently abundant in some sectional or habitat situation to bring them into one or more of our "more abundant" groups. To this 50 per cent we would add, if we could, a variable and unknown number of spring and fall migrants which remain in the state long enough to en-

MORE ABUNDANT SUMMER BIRDS, WHOLE STATE, BY HABITATS

The figures at the heads of the columns on the habitat table have the following meanings:

(1) Meadow; (2) pasture; (3) swamp; (4) waste and fallow; (5) wheat, rye, or barley; (6) oats; (7) corn; (8) stubble of small grain; (9) plowed ground; (10) woods; (11) orchard; (12) shrubbery; (13) yards and gardens.

A.O.U. Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13
201	—	—	X	—	—	—	—	—	—	—	—	—	—
261	X	—	—	—	—	—	—	—	X	—	—	—	—
273	—	—	—	—	—	—	—	—	X	—	—	—	—
289	—	X	X	X	—	X	X	—	—	X	X	X	—
316	X	X	—	X	X	X	X	X	X	X	X	X	—
325	—	—	—	—	—	—	—	—	—	X	—	—	—
360	—	—	—	—	—	—	—	—	—	X	—	—	—
393	—	—	—	—	—	—	—	—	—	X	—	—	—
406	—	X	—	X	—	—	X	—	—	X	—	X	—
412	X	X	—	—	—	—	X	—	—	X	X	—	—
444	X	X	—	X	—	—	—	—	—	X	—	X	—
452	—	—	—	—	—	—	—	—	—	X	—	—	—
456	—	—	—	—	—	—	—	—	—	X	—	—	—
463	—	—	—	—	—	—	—	—	—	X	—	—	—
474b	X	X	—	—	X	X	X	X	X	—	—	—	—
477	—	—	—	X	—	—	—	—	—	X	X	X	—
488	—	X	—	X	X	X	X	X	—	X	—	X	—
494	X	X	X	X	—	X	—	X	—	—	—	—	—
495	—	X	X	—	X	X	X	—	X	X	—	X	X
498	X	X	—	X	X	X	X	—	—	X	—	—	—
501	X	X	X	X	X	X	X	X	X	—	—	X	X
506	—	—	—	—	—	—	—	—	—	—	X	—	—
511b	X	X	X	X	X	X	X	—	—	X	X	—	X
529	—	X	—	X	—	X	X	X	—	X	—	X	—
X	X	X	—	X	X	X	X	X	—	X	X	—	X
540	—	—	—	—	—	—	X	—	—	—	—	—	—
546	X	X	—	—	—	—	—	—	—	—	X	—	—
563	—	X	—	X	—	—	—	—	—	X	—	X	—
581	—	—	X	—	—	—	—	—	—	X	—	—	—
587	—	—	—	—	—	—	—	—	—	X	—	X	—
593	—	—	—	—	—	—	—	—	—	—	—	X	—
598	—	—	—	—	—	—	—	—	—	X	—	X	—
604	X	X	—	X	X	X	—	—	—	X	—	—	—
612	—	—	—	—	—	X	—	X	—	—	—	—	—
613	—	X	—	—	—	—	—	—	—	—	—	—	—
636	—	—	—	—	—	—	—	—	—	X	—	—	—
681	—	—	—	X	—	—	—	—	—	X	—	X	—
683	—	—	—	—	—	—	—	X	—	—	—	X	—
687	—	—	—	—	—	—	—	—	—	X	X	—	—
703	—	—	—	—	—	—	—	—	—	—	X	—	—
704	—	—	—	—	—	—	—	—	—	—	X	X	—
705	—	X	—	X	—	—	X	—	—	X	—	—	—
719	—	—	—	—	—	—	—	—	—	X	—	—	—
724	—	—	—	X	—	—	—	—	—	—	—	—	—
725	—	—	X	—	—	—	—	—	—	—	—	—	—
731	—	—	—	—	—	—	—	—	—	X	—	—	—
755	—	—	—	—	—	—	—	—	—	X	—	—	—
761	—	X	—	—	—	—	—	—	X	X	X	X	X
766	—	X	—	X	—	—	—	—	—	X	—	X	—
Sp. 48	12	21	8	18	9	13	14	9	7	32	12	18	5

title them to consideration as actual though temporary residents, but as it is, we can only say that in our judgment somewhere between 50 and 75 per cent. of our 166 recorded and counted species were found in numbers sufficient to make them worthy of note as effective agents, for good or evil according to their habits, at some time and in some part of the state. In this very general statement, however, we are making no application of the well established fact that birds in great variety of widely different ordinary habit and habitat may concentrate locally and for a considerable time in a habitat which through some exceptional development offers them unusual inducements.*

On the whole it may be reasonably said that the general outcome of our survey warrants the statement that few kinds of birds are really insignificant everywhere and always and that it is a rational economic policy to preserve and protect all not known to be on the whole positively injurious and to decimate, and exterminate if possible, the few which can be definitely and positively so classed.

Concerning the Methods of the Survey

We have frequently remarked upon the discretion to be used in applying the results of our survey, and we have ourselves frequently refrained from drawing seemingly warranted conclusions because of the obvious deficiencies of our data. Unable, of course, to make a complete census of the birds of the state at any time, we have resorted to the method of random sampling; and unless this process is often repeated under every variety of circumstance and condition, the question may always be very properly raised whether the samples chosen adequately represent the whole. We have reason to regret the shortness of the period over which the survey extended and especially the unequal distribution of our data of observation in both time and space, largely due to our limitation to a single field party and the consequent impossibility of making parallel observations in different places at the same time. As the phenomena we were studying were peculiarly subject to seasonal changes, less rapid in summer and winter, but perplexingly so in spring and fall, it was logically necessary that we should have had at least three parties in the field at once, one for each section of the state, all operating on similar programs especially as to times and areas. This being impracticable for us, profitable comparison of our data has been narrowly limited and considerable ingenuity has been called for in the adaptation and assimilation of data of different origin in a way to make them fairly comparable. These differences were attributable to the conditions under which our methods of observation and record were used and not to the methods themselves, which seem to us so well adapted to the end in view that we should not know how

* For an illustrative instance, see "The Regulative Action of Birds upon Insect Oscillations" by S. A. Forbes, Bul. Ill. State Laboratory of Natural History, Vol. I, Art. 6, pp. 1-32, May, 1883.

to improve upon them if we were to continue or repeat the survey. Their special value was in the substitution of precise data, recorded in figures and hence available for accurate comparison and capable of being expanded by subsequent addition, for the vague and variable expressions of degrees of abundance and scarcity now commonly used.

The principal features of method to which we would call attention are:

1. A careful selection of the sample tracts surveyed, with a view to making them as nearly as possible fairly representative of the whole area from which they are chosen.*

2. The accurate recognition and complete enumeration by two observers of all the birds present on long strips or belts of uniform width, one observer recognizing and counting the birds seen on each kind of habitat, and the other recording the distances traveled over each.†

3. The form of field notes written on uniform slips day by day for each trip, the slips being numbered consecutively for convenient reference.

4. The method of tabulation of the observations in a way to make them available for consolidation in various ways and for complete discussion.

5. A species index of the numbered notes such that all the data for each species may be readily assembled.

6. The grouping and tabulation of "residence classes".

7. Use of the tables thus formed in comparing the composition of the bird population in different seasons and especially in different stages of the fall and spring migrations, and the tracing in detail by this means of the successive steps of each migration.

General Species List

The following list of 195 species of which 166 have been statistically treated, comprises all the birds seen and recognized in the entire course of the Illinois survey. The letters in the first three columns of the table indicate a residence classification of the species based primarily on our own observations but taking into account also the published and unpublished observations of others available to us. As our main object is ecological, we have attached relatively little importance to the exceptional occurrence or comparatively insignificant numbers of a species outside its usual range or season of residence, but have classified it only when and where it was found in numbers sufficient to give it some appreciable significance as a feature in the bird life of the time and place.

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* We have repeatedly made mention of the fact that our method of enumeration limited us to birds of more or less open country, excluding us from aquatic situations and from dense forests or lofty trees.

† To make sure that practically all the birds were seen by these observers, several trial trips were made with a third person walking between and some distance behind the two; with the result that the number of additional birds thus flushed was altogether negligible.

The letters used have the following meanings:
P. Permanent resident.
W. Winter resident.
S. Summer resident.
M. Migrant.

In the other columns of the table an X indicates the presence of the species on the 90-foot or 150-foot strip completely surveyed, and a J signifies a species noted by the observers but not seen on the surveyed strip.

LIST OF SPECIES RECOGNIZED WITH THEIR RESIDENCE CLASSIFICATION FOR EACH SECTION OF THE STATE, TOGETHER WITH DATA OF THEIR OCCURRENCE IN EACH SECTION AND EACH SEASON OF THE YEAR

		Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
		Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
6.	Pied-billed Grebe Podilymbus podiceps	S	S	S					J							
51.	Herring Gull Larus argentatus	W	W	W					J							
77.	Black Tern Hydrochelidon nigra surinamensis	M	M	M					X							
120.	Double-crested Cormorant, Phalacrocorax auritus auritus	M	M	M					J		J					
132.	Mallard, Anas platyrhynchos	P	P	P					X		J					
140.	Blue-winged Teal Querquedula discors	S	S	S					X							
143.	Pintail Dafila acuta	M	M	P									X			
144.	Wood Duck Aix sponsa	P	P	P							J					
149.	Lesser Scaup Duck Marila affinis	W	W	W					J							
172.	Canada Goose, Branta canadensis canadensis	W	M	M					X				X			X
190.	Bittern, Botaurus lentiginosus	S	S	S							X					
191.	Least Bittern Ixobrychus exilis	S	S	S				J								
194.	Great Blue Heron Ardea herodias herodias	S	S	S		X					X			X		
201.	Green Heron Butorides virescens virescens	S	S	S		X			X	X	X			X	X	
202.	Black-crowned Night Heron, Nycticorax nycticorax naevius	S	S	S							J			X		
208.	King Rail Rallus elegans	S	S	S					J					X		
212.	Virginia Rail Rallus virginianus	S	S	S										X	X	
214.	Sora Porzana carolina	S	S	S					X		X			X	X	
219.	Florida Gallinule Gallinula galeata	S	S	S					J							
221.	Coot Fulica americana	S	S	S					X							
228.	Woodcock Philohela minor	S	S	S		X	X									
230.	Wilson's Snipe Gallinago delicata	M	M	S	X				X				X			X

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
231. Dowitcher															
Macrorhamphus griseus griseus	M	M	M										X		
239. Pectoral Sandpiper															
Pisobia maculata	M	M	M					X					X		
254. Greater Yellow-legs															
Totanus melanoleucus	M	M	M							J					
255. Yellow-legs															
Totanus flavipes	M	M	M							J					
256. Solitary Sandpiper															
Helodromas solitarius solitarius	M	M	M					X	X	X			X		
261. Upland Plover															
Bartramia longicauda	S	S	S		X			X	X				X		
262. Buff-breasted Sandpiper															
Tryngites subruficollis	M	M	M					X		X					
263. Spotted Sandpiper															
Actitis macularia	S	S	S		X			X					X		
272. Golden Plover															
Charadrius dominicus dominicus	M	M	M					X							
273. Killdeer															
Oxyechus vociferus	S	S	S	X	X	X	X	X	X	X		X	X	X	
289. Bob-white															
Colinus virginianus virginianus	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
305. Prairie Chicken															
Tympanuchus americanus americanus	P	P	P	X	X	X		X	X	X		X	X	X	X
316. Mourning Dove															
Zenaidura macroura carolinensis	P	P	P	X	X	X	X	X	X	X		X	X	X	X
325. Turkey Vulture															
Cathartes aura septentrionalis	P	S	S	X	X	X	X	X	X	X		X	X	X	
326. Black Vulture															
Catharista urubu	P	—	—		X										
331. Marsh Hawk															
Circus hudsonius	P	P	P		X	X		X	X	X	X		X	X	X
332. Sharp-shinned Hawk															
Accipeter velox	P	P	P										X	X	
333. Cooper's Hawk															
Accipeter cooperi	P	P	S			X	X	X					X		
337. Red-tailed Hawk															
Buteo borealis borealis	P	P	P	X	X	X	X	X		X		X	X	X	
339. Red-shouldered Hawk															
Buteo lineatus lineatus	P	P	P	X	X		X								

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
343. Broad-winged Hawk Buteo platypterus	P	S	S			X									
347a. Rough-legged Hawk Archibuteo lagopus sanctijohannis	W	W	W							X	X		X		X
349. Golden Eagle Aquila chrysaetos	P	P	P				X								
352. Bald Eagle Haliaetus leucocephalus leucocephalus	P	P	P				J								
357. Pigeon Hawk Falco columbarius columbarius	M	M	M			X				X					
360. Sparrow Hawk Falco sparverius sparverius	P	S	S	X	X	X	X	X	X	X	X	X	X	X	X
364. Osprey Pandion haliaetus carolinensis	S	S	S							J					
366. Long-eared Owl Asio wilsonianus	P	P	P				X				X				X
367. Short-eared Owl Asio flammeus	P	P	P					X							
368. Barred Owl Strix varia varia	P	P	P	X											
372. Saw-whet Owl Cryptoglaux acadica acadica	P	P	P								J				
373. Screech Owl Otus asio naevius	P	P	P								J				
387. Yellow-billed Cuckoo Coccyzus americanus americanus	S	S	S		X				X	X			X	X	
388. Black-billed Cuckoo Coccyzus erythrophthalmus	S	S	S		X			X					X		
390. Belted Kingfisher Ceryle alcyon	P	S	S	X	X			X	X	X			X	X	
393. Hairy Woodpecker Dryobates villosus villosus	P	P	P		X		X	X		X	X	X	X	X	X
394c. Downy Woodpecker Dryobates pubescens medianus	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
402. Yellow-bellied Sapsucker Sphyrapicus varius varius	M	M	M	X				X		X					

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
405a. Northern Pileated Woodpecker Phloeotomus pileatus abieticola	P	P	P				X								
406. Red-headed Woodpecker Melanerpes erythrocephalus	P	S	S	X	X	X	X	X	X	X		X	X	X	
409. Red-bellied Woodpecker Centurus carolinus	P	P	P	X	X	X	X	X		X	X		X		X
412a. Northern Flicker Colaptes auratus luteus	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
417. Whip-poor-will Antrostomus vociferus vociferus	S	S	S		J										
420. Nighthawk Chordeiles virginianus virginianus	S	S	S		X			X	X	X			X		
423. Chimney Swift Chaetura pelagica	S	S	S		X			X	X	X			X	X	
428. Ruby-throated Hummingbird Archilochus colubris	S	S	S		X			X	X				X	X	
444. Kingbird Tyrannus tyrannus	S	S	S		X			X	X	X			X	X	
452. Crested Flycatcher Myiarchus crinitus	S	S	S		X			X	X						
456. Phoebe Sayornis phoebe	S	S	S	X	X			X	X	X		X	X	X	
461. Wood Pewee Myiochanes virens	S	S	S		X				X	X			X	X	
463. Yellow-bellied Flycatcher Empidonax flaviventris	M	M	M					X							
465. Acadian Flycatcher Empidonax virescens	S	S	S		X								X	X	
466a. Alder Flycatcher Empidonax trailli alnorum	M	M	M		X			X	X	X			X		
467. Least Flycatcher Empidonax minimus	M	S	S					X	X						
474. Horned Lark Otocoris alpestris alpestris	W	W	W									X			X
474b. Prairie Horned Lark Otocoris alpestris praticola	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

		Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
		Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
477.	Blue Jay Cyanocitta cristata cristata	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
488.	Crow Corvus brachyrhynchos brachyrhynchos	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
494.	Bobolink Dolichonyx oryzivorus	M	M	S		X			X	X	X			X	X	
495.	Cowbird Molothrus ater ater	S	S	S	X	X	X		X	X	X		X	X	X	
498.	Red-winged Blackbird Agelaius phoeniceus phoeniceus	S	S	S	X	X	X		X	X	X		X	X	X	
501.	Meadowlark Sturnella magna magna	P	S	S	X	X	X	X	X	X	X	X	X	X	X	
506.	Orchard Oriole Icterus spurius	S	S	S		X			X	X				X		
507.	Baltimore Oriole Icterus galbula	S	S	S		X			X	X	X			X		
509.	Rusty Blackbird Euphagus carolinus	M	M	M	X		X		X		X		X			
510.	Brewer's Blackbird Euphagus cyanocephalus	M	M	M										X		
511b.	Bronzed Grackle Quiscalus quiscula aeneus	S	S	S	X	X	X		X	X	X		X	X	X	
517.	Purple Finch Carpodacus purpureus purpureus	W	W	P				X			X					
528.	Redpoll Acanthis linaria linaria	W	W	W												X
529.	Goldfinch Astragalinus tristis tristis	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
X.	English Sparrow Passer domesticus	P	P	P	X	X	X	X	X	X	X	X	X	X	X	X
533.	Pine Siskin Spinus pinus	W	W	W			X									
534.	Snow Bunting Plectrophenax nivalis nivalis	W	W	W								X				
536.	Lapland Longspur Calcarius lapponicus lapponicus	W	W	W					X			X	X			X

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
537. Smith's Longspur Calcarius pictus	M	M	M					X							
540. Vesper Sparrow Pooecetes gramineus gramineus	M	S	S	X	X	X		X	X	X		X	X	X	
542a. Savannah Sparrow Passerculus sandwichensis savanna	M	M	S	X		X		X		X			X	X	
546. Grasshopper Sparrow Ammodramus savannarum australis	P	S	S	X	X	X		X	X	X			X	X	
547. Henslow's Sparrow Passerherbulus henslowi henslowi	S	S	S			X			X	X					
548. Leconte's Sparrow Passerherbulus lecontei	M	M	M							X					
549l. Nelson's Sparrow Passerherbulus nelsoni nelsoni	M	M	M							X					
552. Lark Sparrow Chondestes grammacus grammacus	S	S	S		X			X	X				X		
554. White-crowned Sparrow Zonotrichia leucophrys leucophrys	W	M	M	X		X		X		X					
558. White-throated Sparrow Zonotrichia albicollis	W	M	M	X		X	X	X		X					
559. Tree Sparrow Spizella monticola monticola	W	W	W	X		X	X	X		X	X	X			X
560. Chipping Sparrow Spizella passerina passerina	S	S	S	X	X	X		X	X	X			X	X	
563. Field Sparrow Spizella pusilla pusilla	S	S	S	X	X	X	X	X	X	X			X	X	
567. Slate-colored Junco Junco hyemalis hyemalis	W	W	W	X		X	X	X		X	X	X			X
575a. Bachman's Sparrow Peucaea aestivalis bachmani	S	S	S	X	X			X							
581. Song Sparrow Melospiza melodia melodia	P	P	S	X		X	X	X	X	X	X	X	X	X	X
583. Lincoln's Sparrow Melospiza lincolni lincolni	S	S	S			X				X					

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

		Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
		Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
584.	Swamp Sparrow Melospiza georgiana	W	M	S		X	X	X	X		X	X		X	X	X
585.	Fox Sparrow Passerella iliaca iliaca	W	M	M			X	X	X		X					
587.	Towhee Pipilo erythrophthalmus erythrophthalmus	P	S	S	X	X	X	X	X	X	X			X		
593.	Cardinal Cardinalis cardinalis cardinalis	P	P	P	X	X	X	X	X	X	X	X		X		
595.	Rose-breasted Grosbeak Zamelodia ludoviciana	M	S	S						X				X		
598.	Indigo Bunting Passerina cyanea	S	S	S		X			X	X	X			X	X	
604.	Dickcissel Spiza americana	S	S	S		X			X	X	X			X	X	
608.	Scarlet Tanager Piranga olivacea	S	S	S		X			X							
610.	Summer Tanager Piranga rubra rubra	S	S	S		X										
611.	Purple Martin Progne subis subis	S	S	S		X			X		X			X	X	
612.	Cliff Swallow Petrochelidon lunifrons lunifrons	S	S	S		X			X	X	X			X	X	
613.	Barn Swallow Hirundo erythrogastra	S	S	S	X	X			X	X	X			X	X	
614.	Tree Swallow Iridoprocne bicolor	S	S	S					X		X					
616.	Bank Swallow Riparia riparia	S	S	S		X			X	X	X			X		
617.	Rough-winged Swallow Stelgidopteryx serripennis	S	S	S					J							
618.	Bohemian Waxwing Bombycilla garrula	W	W	P										X		
619.	Cedar Waxwing Bombycilla cedrorum	P	P	P							X					
622e.	Migrant Shrike Lanius ludovicianus migrans	P	P	S	X	X	X	X	X	X	X	X	X	X	X	X
624.	Red-eyed Vireo Vireosylva olivacea	S	S	S		X			X	X	X			X		
626.	Philadelphia Vireo Vireosylva philadelphica	M	M	M							X					
627.	Warbling Vireo Vireosylva gilva gilva	S	S	S		X				X				X	X	

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
628. Yellow-throated Vireo															
Lanivireo flavifrons	S	S	S							J					
629. Blue-headed Vireo															
Lanivireo solitarius solitarius	M	M	M							X					
631. White-eyed Vireo															
Vireo griseus griseus	S	S	S		X										
633. Bell's Vireo															
Vireo belli belli	S	S	S		J										
636. Black and White Warbler															
Mniotilta varia	S	S	S					X	X	X			X	X	
637. Prothonotary Warbler															
Protonotaria citrea	S	S	S		J			J							
638. Swainson's Warbler															
Helinaia swainsoni	S	S	S		J										
639. Worm-eating Warbler															
Helmitheros vermivorus	S	S	S						X						
641. Blue-winged Warbler															
Vermivora pinus	S	S	S					J		J					
645. Nashville Warbler															
Vermivora rubricapilla rubricapilla	M	M	M							X			X	X	
646. Orange-crowned Warbler															
Vermivora celata celata	M	M	M							X					
647. Tennessee Warbler															
Vermivora peregrina	M	M	M							X			X	X	
648a. Northern Parula Warbler															
Compsothlypis americana usneae	S	S	S					X							
650. Cape May Warbler															
Dendroica tigrina	M	M	M										X	X	
652. Yellow Warbler															
Dendroica aestiva aestiva	S	S	S		X								X		
654. Black-throated Blue Warbler															
Dendroica caerulescens caerulescens	M	M	M										X	X	
655. Myrtle Warbler															
Dendroica coronata	M	M	M			X		X		X					
657. Magnolia Warbler															
Dendroica magnolia	M	M	M					X		X			X	X	
659. Chestnut-sided Warbler															
Dendroica pensylvanica	M	M	S					X	X				X	X	

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
661. Black-poll Warbler Dendroica striata	M	M	M										X	X	
662. Blackburnian Warbler Dendroica fusca	M	M	M							J					
663a. Sycamore Warbler Dendroica dominica albilora	S	S	S	J											
667. Black-throated Green Warbler Dendroica virens	M	M	M							X			X	X	
671. Pine Warbler Dendroica vigorsi	P	S	S		X										
672. Palm Warbler Dendroica palmarum palmarum	M	M	M					X		X			X	X	
674. Oven-bird Seiurus aurocapillus	S	S	S					J							
675a. Grinnell's Water-Thrush Seiurus noveboracensis notabilis	M	M	M					X					X	X	
676. Louisiana Water-Thrush Seiurus motacilla	S	S	S					J							
677. Kentucky Warbler Oporornis formosus	S	S	S					J							
679. Mourning Warbler Oporornis philadelphia	M	M	M					J							
681d. Maryland Yellow-throat Geothlypis trichas trichas	S	S	S		X			X	X	X			X		
683. Yellow-breasted Chat Icteria virens virens	S	S	S		X			X							
684. Hooded Warbler Wilsonia citrina	S	S	S			J									
686. Canada Warbler Wilsonia canadensis	M	M	M					J							
687. Redstart Setophaga ruticilla	S	S	S					X	X	X			X	X	
697. Pipit Anthus rubescens	M	M	M	X		X		X		X					X
703. Mockingbird Mimus polyglottos polyglottos	P	S	S		X	X	X	X	X	X			X		
704. Catbird Dumetella carolinensis	S	S	S		X			X	X	X			X	X	
705. Brown Thrasher Toxostoma rufum	S	S	S	X	X			X	X	X			X	X	

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Continued*

		Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
		Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
718.	Carolina Wren Thryothorus ludovicianus ludovicianus	P	S	S		X	X	X								
719.	Bewick's Wren Thryomanes bewicki bewicki	S	S	S		X	X		X		X					
721a.	Western House Wren Troglodytes aedon parkmani	S	S	S		X			X	X	X			X		
722.	Winter Wren Nannius hiemalis hiemalis	W	W	M			X									
724.	Short-billed Marsh Wren Cistothorus stellaris	W	S	S		X			X		X			X	X	
725.	Long-billed Marsh Wren Telmatodytes palustris palustris	S	S	S										X	X	
726.	Brown Creeper Certhia familiaris americana	W	M	M				X	X		X					X
727.	White-breasted Nuthatch Sitta carolinensis carolinensis	P	P	P		X	X	X	X	X	X	X	X		X	X
728.	Red-breasted Nuthatch Sitta canadensis	M	M	M							X					
731.	Tufted Titmouse Baeolophus bicolor	P	P	P		X	X	X	X		X	X				
735.	Chickadee Penthestes atricapillus atricapillus	P	P	P		X			X		X	X	X	X	X	X
736.	Carolina Chickadee Penthestes carolinensis carolinensis	P	P			X	X	X	X	X	X	X				
748.	Golden-crowned Kinglet Regulus satrapa satrapa	W	W	M			X		X		X					
749.	Ruby-crowned Kinglet Regulus calendula calendula	M	M	M					X		X					
751.	Blue-gray Gnatcatcher Polioptila caerulea caerulea	S	S	S							X					
755.	Wood Thrush Hylocichla mustelina	S	S	S		X					X					
756.	Veery Hylocichla fuscescens fuscescens	M	M	S					X							

LIST OF SPECIES RECOGNIZED WITH THEIR CLASSIFICATION, ETC.—*Concluded*

	Residence classification			Southern Illinois				Central Illinois				Northern Illinois			
	Southern Illinois	Central Illinois	Northern Illinois	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
757. Gray-cheeked Thrush Hylocichla aliciae aliciae	M	M	M					J							
758a. Olive-backed Thrush Hylocichla ustulata swainsoni	M	M	M					X		X					
759b. Hermit Thrush Hylocichla guttata pallasi	W	M	M					X							
761. Robin Planesticus migratorius migratorius	P	S	S		X	X	X	X	X	X		X	X	X	
766. Bluebird Sialia sialis sialis	P	S	S		X	X	X	X	X	X		X	X	X	X

EXAMPLES OF FIELD NOTES, INDEX CARDS, AND PRINCIPAL TABLES MADE UP FROM THEM.

FIELD NOTES

The following copies of four note slips will sufficiently illustrate the method of recording the field data. The number following the date at the head of the slip, is the serial number of the slip itself. The figures opposite the names of habitats ("pasture", "stubble", "corn stalks", etc.) show the number of paces taken in crossing a field, the observer counting the birds on a 50-yard strip except where the habitat name is followed by the expression "30 yards". The number and kinds of birds seen in each field on the 50-yard or 30-yard strip are shown by the figures under the habitat name, the first the number of birds and the second the A. O. U. number for the species name.* (8-289 means 8 bob-whites or quails seen in crossing a pasture 310 paces wide.)

Feb. 14, 1907 — 507
Brownfield, Illinois
Fair, cold, wind N. E.
Ground not frozen. — 8:00 A. M.
Pasture — 310
8-289
Stubble — 80
1-567
Pasture — 92
(Broken trees)
13-567
Weeds — 34
30 yd.
Feb. 14, 1907 — 508
C. Stalks — 270
8-501
24-567

* The symbol X is used for the English sparrow.

3-766
1-4746
Timothy 42
(Grasshopper, a butterfly, and small gnats found)
Shrubbery 312
30 yd.
2-559
7-567
1-517
19-289
Timber 242
30 yd.
3-567
1-718
1-727
2-731
2-409
Pasture 394
(Some shrubbery)
Stubble 570
1-581
C. Stalks 100
10-501

Feb. 14, 1907 509
Pasture 56
C. Stalks 116
Pasture 120
Stubble 220
Waste Ld. 214
Road—12:10
Timber 288
30 yd.
1-559
1-567
C. stalks 37
Weeds 306
(A few apple trees)
30 yd.
Orchard 80
Stubble 294
Orchard 94
(Yg. wheat)
Road 11:00 A. M.

Pasture 332
Timothy 82
3-501
Plowed Gd. 294
C. Stalks 154
Beans (garden) 88
Shrubbery 25
30 yd.
2-766
Pasture (Weeds) 64
C. Stalks 75
C. Stubble (corn) 97
Wild grass 47
Wheat 134
Stubble 117
Barnyard 152
2-X

Feb. 14, 1907 510
Waste Gd. 372
Timber 989
30 yd.
2-563
18-567
1-731
1-593
Wheat 218
C. Stubble 47
Pasture 60
Shrubbery 555
30 yd.
1-394c
8-517*
Wheat 104
Timber 418
30 yd.
2-736
Weeds 156
Pasture 274
(Horses)
Waste Gd. 103
Golconda, Ill., 2:30 P. M.

* 3 males, 5 females.

INDEX CARDS

The black-face figures on the following cards indicate the species names (305, prairie chicken, and 444, kingbird) and the other figures refer to the serial numbers of the field note-slips on which the species is mentioned. The index cards are filed in the order of their species numbers.

305– 48, 77, 89, 104, 121,
217, 281, 285, 291, 309, 316,
324, 328, 330, 336, 544, 570,
588, 589, 592, 601, 614, 616,

617, 631, 642, 648, 650, 651,
687, 710, 735, 739, 806, 819,
825, 831, 833, 834, 848, 849,
1131, 1162, 1185, 1198, 1204, 1220,
1295, 1343, 1488, 1490, 1555, 1570,
1580, 1582, 1798, 1809, 1813, 1856,
1928, 2039

444– 1440, 1443, 1447, 1448, 1454,
1459, 1460, 1462, 1464, 1467, 1471,
1472, 1475, 1481, 1493, 1497, 1513,
1514, 1520, 1530, 1545, 1554, 1565,
1569, 1574, 1580, 1583, 1585, 1590,
1591, 1597, 1601, 1608, 1612, 1614,
1624, 1625, 1626, 1628, 1634, 1636,
1640, 1641, 1642, 1643, 1645, 1648,
1649, 1667, 1671, 1675, 1677, 1679,
1680, 1697, 1701, 1702, 1703, 1704,
1714, 1719, 1734, 1742, 1747, 1751,
1771, 1775, 1781, 1785, 1802, 1812,
1818, 1819, 1820, 1824, 1827, 1828,
1829, 1835, 1842, 1843, 1844, 1845,
1853, 1859, 1862, 1868, 1872, 1876,
1884, 1888, 1890, 1895, 1896, 1904,
1909, 1918, 1932, 1933, 1934, 1944,
1947, 1960, 1961, 1964, 1967, 1980,
1990, 1994, 2000, 2016, 2027.

Table III

Northern Illinois, September 6–15, 1909

Most abundant species, amounting to 85% of whole number identified; with ratios of each number to total number of birds.

Species	Number of each	Ratio to total number of birds Per cent.
X	1369	34.0
511b	1321	33.0
494	428	10.7
761	105	2.6
498	100	2.5
412	84	2.1
Total	3407	84.9

Whole number = 4017
85% = 3414

TABLE IV

NORTHERN ILLINOIS, SEPTEMBER 6–15, 1909

Showing distance traveled over each crop, acreage of each crop, and ratio of acreage of each crop to total acreage covered.

Yards	891	22.2	17.82	11409
Gardens	63	1.6	1.19	765
Waste and fallow	19	0.5	0.64	408
Swamp	14	0.3	1.03	657
Wheat	4	0.1	1.00	640
Total	4017	100.	2.27	1458

TABLE IV

NORTHERN ILLINOIS, SEPTEMBER 6–15, 1909

Showing distance traveled over each crop, acreage of each crop, and ratio of acreage of each crop to total acreage covered.

Crops	Distance traveled in miles	Acreage covered	Ratio to total acreage Per cent.
Corn	28.23	513.22	29.3
Pasture	23.76	431.96	24.6
Meadow	12.61	229.25	13.1
Stubble	19.68	357.78	20.4
Orchard	1.29	9.38	0.5
Timber	0.99	7.18	0.4
Plowed ground	2.34	42.54	2.4
Yards	2.75	50.00	2.8
Gardens	2.90	52.72	3.0
Waste and fallow	1.64	29.82	1.7
Swamp	0.75	13.64	0.8
Wheat	0.22	4.00	0.2
Oats	0.80	14.54	0.8
Total	97.96	1756.03	100.

TABLE V

NORTHERN ILLINOIS, SEPTEMBER 6–15, 1909

Showing the number of "All Birds" in each crop, per cent. in each crop, birds per acre, and birds per square mile.

Crops	Number of Birds	Ratio to total No. of birds Per cent.	Birds per Acre	Birds per Square Mile
Corn	1551	38.6	3.02	1937
Pasture	681	17.0	1.58	1010
Meadow	321	8.0	1.40	895
Stubble	254	6.3	0.71	455
Orchard	171	4.2	18.23	11712
Timber	20	0.5	2.78	1786
Plowed ground	28	0.7	0.65	420
Yards	891	22.2	17.82	11409
Gardens	63	1.6	1.19	765
Waste and fallow	19	0.5	0.64	408
Swamp	14	0.3	1.03	657
Wheat	4	0.1	1.00	640
Total	4017	100.	2.27	1458

TABLE VI (a)

NORTHERN ILLINOIS, WINTER, NOVEMBER 23–30, 1906 AND JANUARY 2–16, 1907

Showing the number of each principal species that was observed in each of the principal crops.

Species	Corn	Stubble	Pasture	Meadow	Plowed	Woods	Shrubbery and gardens	Fallow and waste	All crops
X	13	1	31	1	4				50
305	19	9	4						32
394c	3		2			6	2	1	15
474b*		15	11	3	8				75
477	3		7			1	12	2	25
488	30	57	28	19	2	15		33	207
529	58	4	116	1					179
536†	65	160	1	158	7				675
559	18	6	43	3		4		62	137
735	5		16			6	8	6	43
All birds	225	258	272	193	30	41	25	127	1520

* 38 out of 75 of the 474b were found in wheat fields.
† 284 out of 675 of the 536 were found in wheat fields.

TABLE VI (b)

BELOIT, WISCONSIN, TO EARLVILLE, ILLINOIS, NOVEMBER 23–30, 1906

Showing number of principal birds in principal crops per square mile.

Species	Corn	Stubble	Wheat	Plowed ground	Pasture	Meadow crops
X	27.1			16.5	3.4	6.0
305	39.7	57.3			13.6	
474	6.3				27.2	6.0
474b		12.7		8.3	13.6	18.1
488	41.7	38.2		8.3	23.8	78.4
529	6.3				68.1	
536	135.7		6035.0	29.0	3.4	952.4
559	25.0				47.7	12.1

TABLE VI (c)

NORTHERN ILLINOIS, WINTER, NOVEMBER 23-30, 1906, AND JANUARY 2-16, 1907

Showing the per cent. of each principal species that was observed in each of the principal crops.

Species	Corn %	Stubble %	Pasture %	Meadow %	Plowed %	Woods %	Shrubbery and Gardens %	Fallow and Waste %
X	26.0	2.0	62.0	2.0	8.0			
305	59.4	28.1	12.5					
394c	20.0		13.3			40.0	13.3	6.7
474b		20.0	14.7	4.0	10.7			
477	12.0		28.0			4.0	48.0	8.0
488	14.5	27.5	13.5	9.2	1.0	7.2		15.9
529	32.4	2.2	64.8	0.6				
536	9.6	23.7	0.1	23.4	1.0			
559	13.1	4.4	31.4	2.2		2.9		45.3
735	11.6		37.2			14.0	18.6	14.0