

SEASONAL FLUCTUATIONS IN BIRD LIFE IN CENTRAL OKLAHOMA

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THIS STUDY is based primarily on 128 censuses of a half-mile stretch of creek bed near Norman, Oklahoma, the observations extending over three years. The results were so interesting to me that in 1926 I tested them by a series of monthly censuses over eight miles of diversified country; on the whole these long trips have corroborated the findings on the sample area.

Seven years ago the "First Half Mile of Snail Brook" was a woods in miniature, with primeval trees, a great deal of undergrowth, weeds, a stream and small pond, bordered by a few acres of unbroken prairie and cultivated fields; at all times cover, food and water were present in abundance. The reasons why this small tract proved representative of the bird life in general were three: First, it was attractive to a wide variety of birds; second, it was attractive at all times of the year; and, finally, it was comparatively isolated, yet not entirely so, for to the east, west and north there was no cover at all, but to the south the creek with its trees and bushes formed an avenue for many birds to come up from the deep woods near the South Canadian River.

The "Second Half Mile of Snail Brook" had large trees, but little undergrowth, almost no weeds and no pond. Consequently, the 52 censuses on this tract show much greater variation in bird life in a given season than the First Half Mile. The campus of the University of Oklahoma, which is liberally planted with trees, supports a great number of nesting birds; but because it lacks shrubbery and water, it is of little importance as a bird resort in winter and during the migrations.

Norman is in the Upper Sonoran life zone, its elevation is 1247 feet, and its rainfall averages between 30 and 35 inches a year. The summers are hot, the thermometer often going above 100 for a week at a time. The winters on the whole are rather mild, with many days reaching 70° and 80°; this pleasant weather, however, is varied by northers that bring bleak weather and occasionally near-zero temperatures. There is little snowfall.

SEASONAL FLUCTUATIONS AT SNAIL BROOK

The trees bordering Snail Brook (for brevity's sake this name will refer merely to the particular half mile¹ studied) are black willows, red and white elms, a few large cottonwoods, many hackberries, box elders and mulberries; the chief shrubs are wild plum, dogwood, elder-berry and coral-berry; the vines are poison ivy, wild grape, bit-tersweet, greenbriar and woodbine, while the commonest weed is giant ragweed. Surrounding the little pond there used to be three or four acres of unbroken prairie. On the rest of the land, on each side of the stream, corn, oats, wheat and cotton are raised. Bird enemies have not been plentiful; occasionally a Sharp-shinned or Cooper hawk has been seen in the fall, and a few cats have been met.

In December, 1919, at which time my systematic observations began, Snail Brook was being used as a pasture, but the cattle were soon removed. Since vegetation was allowed to grow unchecked, the region became a better bird resort than before; but in the spring of 1921 the pond was drained and a small house built on the prairie. The vegetation was not disturbed until the summer of 1922, when considerable cutting

¹ The 40 acres of this study are the east half of west half of southwest quarter section 31 R. 2 W.; the eastern border is Pickard Avenue; the western border is an imaginary line half way between this and the road to the west of the section; Lindsay Avenue is the northern edge and West Boyd Street the south.

down of trees and undergrowth took place along the north third of the tract. Because of the progressively greater destruction after this, I am confining this study to three years, December, 1919, to December, 1922.

On each "census" I went the whole half mile, recording each bird to the best of my ability; on a "visit" only a portion of the area was covered. Since the trees and thickets merely bordered the small creek, it was possible to get fairly accurate censuses as long as the leaves were off; the late spring, summer and early fall censuses were not as accurate as the others. Two censuses were taken in December, 1919, 43 during 1920, 40 in 1921, and 43 in 1922; 10 visits were made in December, 1919, 36 in 1920, 10 in 1921, and 2 in 1922. Only the censuses are counted in the calculations for the seasonal variations, but visits were often valuable for the recording of new arrivals.

So far as the birds are concerned, there are seven seasons in this region; for spring falls into early and late portions, and in the fall there are three divisions.

Winter I have counted as lasting from the first of December to about February 20; the arrival of the first scattering spring birds and (on Snail Brook) the swelling of the numbers of the winter residents by additions from the south marks the beginning of "early spring". This season lasts two months during which time the early spring transients and summer residents arrive and some of the winter residents leave. April 21 to 24 usually marks the height of the spring migration when the bulk of the summer residents come; by the end of May all are here, while the last of the winter birds and practically all the transients have left; hence I have called this period "late spring".

Summer lasts from June 1 to the middle of August; the predominating birds are the breeders, although a few transients have been recorded. "Early fall" from late August to late September sees the departure of nearly all the summer residents and the arrival of a few scattered transients. "Mid fall" is a period of about two weeks usually occurring from the last of September to about the 12th of October; it marks the lowest point of bird life throughout the year; for practically all the summer birds have left and the arrivals from the north are as yet very scarce. A great change comes the middle of October or a few days earlier; for the bulk of the fall migrants begin to arrive.

The seasonal variations in bird life at Snail Brook from 1920 through 1922 are shown in the accompanying table (I) where the results of 128 censuses of species and individuals are given.

In general, there has been much uniformity throughout the three years, the chief difference being that from late April, 1922, the number of birds decreased on account of the inroads of civilization. The average number of species seen in late fall and winter has been much the same, 12 to 13; this average has increased slightly to 14 in early spring, risen to its maximum of 22 in late spring, decreased a little in summer to 20.6, dropped to the winter level in early fall, while in mid fall it reached the lowest point of all, 7.2.

The number of individuals was greater during the cold half of the year than the warm, the average of 73 in late fall rose to 93 in winter, averaged sometimes more and sometimes less in early spring, fell to 57 in late spring, to 46 in summer, rose a little in early fall, but reached the exceedingly low figure of 14 in mid fall.

Winter shows the most stable population of any season except summer. There are three reasons for the increase of both species and individuals in the second and third winters in comparison to the first: there was more shrubbery and weeds due to the removal of the cattle; Harris Sparrows have increased markedly since 1920 as wintering birds in this whole region; during the second and third winters more kinds of sparrows remained than during the first one (White-crowned, Lincoln, Leconte and

TABLE I.—NUMBERS OF NATIVE BIRDS SEEN ON SNAIL BROOK

Winter		Species			Individuals	
		Number of Censuses	Average Number	Range	Average Number	Range
1919-20	Dec. 6-Feb. 19	6	10	8-14	53	26-73
1920-21	Dec. 5-Feb. 13	8	14	12-19	109	55-166
1921-22	Dec. 6-Feb. 14	11	13	8-18	117	50-182
Total		25	Aver. 12.5	8-19	93	26-182
Early Spring						
1920	Feb. 23-Apr. 19	10	12.8	9-20	100	26-252
1921	Feb. 20-Apr. 19	11	13.3	7-20	74	12-164
1922	Feb. 20-Apr. 18	10	15.8	11-23	98	52-131
Total		31	Aver. 14	7-23	91	12-252
Late Spring						
1920	Apr. 21-May 25	9	24	19-31	60	50-83
1921	Apr. 25-May 31	6	22	14-27	60	46-70
1922	Apr. 25-May 18	5	19	17-20	50	39-74
Total		20	Aver. 22	14-31	57	39-83
Summer						
1920	June 1-Aug. 11	5	21	18-26	46	29-60
1921	June 9	1	23	23	41	41
1922	June 8-Aug. 10	4	18	15-22	52	25-86
Total		10	Aver. 20.6	15-26	46	25-86
Early Fall						
1920	Aug. 22-Sept. 17	2	12.5	12-13	62	54-70
1921	Sept. 27	1	15	15	71	71
1922	Aug. 31-Sept. 26	4	10.5	9-13	32	21-48
Total		7	Aver. 12.5	9-15	55	21-71
Mid Fall						
1920	Sept. 29-Oct. 10	4	8	6-11	17	10-26
1921	Oct. 5-Oct. 13	2	5	5	12.5	10-15
1922	Oct. 1-Oct. 7	2	8.5	8-9	13.5	12-15
Total		8	Aver. 7.2	5-11	14	10-26
Late Fall						
1920	Oct. 16-Nov. 29	6	14	9-18	94	63-167
1921	Oct. 18-Nov. 28	9	12	7-18	84	34-130
1922	Oct. 11-Nov. 25	10	12	8-17	40	17-90
Total		25	Aver. 13	7-18	73	17-167

Savannah sparrows), while Arctic Towhees were more common. The regular winter residents were Harris, Field and Song sparrows, Juncos, Cardinals and Plumbeous Chickadees.

The vegetation on Snail Brook shows signs of spring long before there is any change among the birds; on February 12, 1920, and January 28, 1921, elms were in full bloom, grass was green and sourdock two inches high. "Early spring" attained its maximum numbers of both species and individuals during the first half of March. The numbers of birds vary more during this season than in any other. In 1920 and 1921, there was severe cold weather near the end of March; this checked migration and corresponded to a marked diminution in the numbers of both species and individuals of birds, the second week in April showing an increase again. The spring of 1922, however, advanced without setbacks and there was no dearth of birds at this period. Tree Sparrows leave in March, the last Song Sparrows and Juncos about

the middle of April. Killdeer and Cowbirds usually appear in late February; Western Mourning Doves, Bronzed Grackles, Phoebes, Vesper Sparrows, Ruby-crowned Kinglets, Blue-gray Gnatcatchers and Brown Thrashers generally come in March, while Scissor-tailed Flycatchers, Western Lark Sparrows and many transient sparrows are due in early April. Bluebirds, Downy Woodpeckers and Chickadees start nesting in March.

Between April 20 and May 5 the great bulk of summer residents and transients may be expected. "Late spring" has the maximum number of species, for all four categories of birds are present, the permanent residents, all the summer residents, many transients and a few winter residents; for Harris Sparrows and Arctic Towhees do not leave until early May. Acadian Flycatchers, Orange-crowned Warblers, Western House Wrens and Olive-backed Thrushes were regular transients.

It seems curious that there is so little difference in the average number of species seen in a census in late spring and one in summer; several suggestions may be offered in explanation. The main reason is that, since we have few transient warblers, our spring migrations are not marked by the "waves" that are encountered in the east. It must also be considered that several different species of transients, seen on different days, would count no more in the averages than one summer resident. More different kinds of birds were seen in late spring than during any other season; for 73 species were recorded in that season during the three years, 60 in early spring, 60 in late fall, 46 in summer, 44 in winter, 35 in early fall and 30 in mid-fall.

In summer a number of birds visit Snail Brook that do not nest on it; moreover, Solitary Sandpipers have been recorded on June 4 and August 11, 1920, and a Yellow-bellied Flycatcher also on the latter date. I calculated that 22 species and 31 pairs nested on the forty acres in 1920, 23 species and 37 pairs in 1921, and 18 species and 23 pairs in 1922, 33 different species in all. The following birds nested every year: Western Mourning Dove, Yellow-billed Cuckoo, Blue Jay, Orchard Oriole, Bronzed Grackle, Western Lark Sparrow, Cardinal, Blue Grosbeak, Western Mockingbird, Brown Thrasher and Plumbeous Chickadee. Eight species nested two years: Bobwhite, Crested Flycatcher, Eastern Meadowlark, Baltimore Oriole, Dickcissel, Bell Vireo, Yellow Warbler and Robin; while 14 species bred during one year only: Southern Downy Woodpecker, Red-headed Woodpecker, Scissor-tailed Flycatcher, Kingbird, Wood Pewee, Red-winged Blackbird, Cowbird, Indigo Bunting, Painted Bunting, Maryland Yellow-throat, Catbird, Carolina Wren, Texas Wren and Bluebird.

During early fall a few birds are still occupied with families until late August: Doves, Cardinals, Blue Grosbeaks and Catbirds; but most of the summer residents gradually leave. The transients are scattering: an occasional Bittern, Red-shafted Flicker, Redstart, and the migrating swallows.

Mid fall is a curious time because of the striking lack of birds; since all the summer birds but a few doves, Scissor-tails and Brown Thrashers have left, and the transients are few and far between, the population is confined almost to the permanent residents. Thus we have the opposite condition from that obtaining five months earlier. Not only are the species few; the individuals are even more reduced proportionately. Nevertheless, interesting transients sometimes appear; for instance, Red-tailed, Red-shouldered and Sparrow hawks, a Yellow-bellied Sapsucker, Phoebe, Western Meadowlark, Golden-crowned and Ruby-crowned kinglets, and even a Rock Wren.

A great change occurs from the 12th to the 16th of October, for then the fall sparrows come; the thickets are full of birds many of which pass on, but their places

are filled by later arrivals. Some years there is a decrease in birds in late October and early November, but in other years the number of species stays much the same throughout late fall, the number of individuals fluctuating somewhat but increasing toward the end of November. By this time the winter population is well established.

One hundred and thirteen species of native birds were recorded from 1920 through 1922; 94 were seen the first year, 86 the next, and 83 the third year. Of these, 10 were permanent residents on Snail Brook, 23 summer residents, 34 winter visitants and 46 transients.

I have found only two studies that can well be compared with mine, that is, where the seasonal variations in the bird life of a limited area are considered; one of these comes from the Atlantic coast and the other from the Pacific. Mr. H. W. Wright (*Birds of the Boston Public Garden*, Boston, Houghton Mifflin, 1909, 238 pp.) found that the 24 acres of the Boston Public Gardens were chiefly a stopping place in migration; during seven winters there were no birds at all, but during two a pair of Chickadees stayed there; in the summer from 3 to 5 species nested. From March to May, from 52 to 80 different species were seen each spring, the daily counts ranging apparently from no birds at all to as many as 38 species and 90 individuals, and 28 species and 137 individuals. The average number of individuals seen during 15 days in May ranged from 11 to 44 during the nine years. One hundred and sixteen kinds of native birds were recorded for the Gardens.

On the campus of the University of California (J. Grinnell, *Condor*, xvi, 1914, pp. 28-40) a very different situation is shown; for the "number of birds to be seen at any one time is pretty constant. A daily 'horizon', that is, the number of species noted in the course of one day's or part day's observation, consists ordinarily of 20 to 24 species." Examples of such horizons were January 20, 20 species; February 11, 26; March 25, 22; July 3, 29, and October 18, 27. At that time 97 species had been found on the 523 acres of the Berkeley campus, but by now (Grinnell and Wythe, *Birds of the Berkeley Campus*, Museum of Vertebrate Zoology, Univ. of Calif., 1926) the number has reached 135, of which 38 are permanent residents, 21 summer residents, 40 winter visitants, 18 transients and 18 vagrants.

SEASONAL FLUCTUATIONS ON THE EIGHT-MILE CENSUS

Largely for the purpose of checking the results on seasonal fluctuations in bird life obtained on Snail Brook from 1920 to 1922, in 1926 I mapped out an eight-mile walk over varying kinds of habitats: two miles of Snail Brook, a pond, a small swamp, deep woods, prairie, the South Canadian River, and streets in town. I took a census of this each month with an extra trip in October. (During the summer I had to divide the territory and make three expeditions early in the morning for each month.) The results are shown in Table II.

The findings of these eight-mile censuses and the half-mile ones corroborate each other well on the whole, especially in respect to the numbers of species seen. There is a rise from the winter numbers of 36, 39 and 35 to 45 in early spring, reaching the maximum of 61 and 66 in late spring; a uniform level of 55 during the three summer months, a drop to 44 in early fall, and to 32 in mid fall; a rise to 44 on October 16 at the peak of the fall migration and a return to the winter level of 37 in November. These figures correspond remarkably well, proportionally, to those of Snail Brook, the only difference being that in comparison to the winter numbers, Snail Brook's summer population was slightly higher than that of the eight-mile census, while somewhat more birds were found on the latter than the former during early and mid fall.

As to individuals, the increases and decreases in numbers follow in general the same lines as at Snail Brook: more birds were found in winter than at any other time;

TABLE II.—NUMBERS OF NATIVE BIRDS ON THE EIGHT MILE CENSUSES COMPARED WITH SNAIL BROOK

Season	Numbers of Birds on 8 Mile Censuses		Average Numbers on Snail Brook		
	Date	No. of Species	No. of Individuals	No. of Species	No. of Individuals
Winter	Dec. 4	36	860	—	—
	Jan. 1	39	2400	12.5	93
	Feb. 1	35	1400	—	—
Early Spring	Mar. 20	45	600	14	91
Late Spring	Apr. 24	61	460	22	57
	May 4	66	450	—	—
Summer	June 1, 11, 21	54	460	20.6	46
	July 4, 14, 27	55	550	—	—
	Aug. 1, 10, 12	55	460	—	—
Early Fall	Sept. 18	44	340	12.5	55
Mid Fall	Oct. 2	32	200	7.2	14
Late Fall	Oct. 16	44	950	13	73
	Nov. 13	37	550	—	—

in late spring there were fewer birds than in early spring; summer gave about the same numbers as late spring (except for July when flocks of Robins and Grackles gave 50 extra birds); mid fall dropped to a seventh of the winter average, while late fall approached the winter numbers.

The difference between winter and early spring is much greater on the eight-mile censuses than at Snail Brook, due partly to the great flocks of blackbirds and crows seen during January and February, 1926, and also to the fact that the single census in early spring was taken at a time when numbers were rather low. (If I had gone February 20, also, the average number of individuals in early spring would undoubtedly have been larger.) Early fall on the long trip shows fewer individuals than does summer, while with Snail Brook the opposite is true; the explanation probably lies in the fact that conditions are fluctuating at this season; on another day I might have met several flocks of birds and have recorded more birds than in summer. Early fall is represented by rather few censuses, only seven on Snail Brook and one eight-mile walk.

One hundred and thirty-one kinds of birds were seen on these trips in 1926; of these, 22 are residents in the general region, 39 summer residents, 25 winter visitants and 45 transients.

SUMMARY.—From 128 censuses during three years on a representative tract of land forty acres in extent, and also from 13 censuses taken during one year over eight miles of diversified country, certain conclusions can be drawn as to the seasonal fluctuations of bird life in Cleveland County, Oklahoma:

1. The number of species present increases gradually from its winter level to a maximum in late April or early May, decreases somewhat in summer, more in early fall and very markedly in early October, increasing again rather suddenly in mid-October to the winter level.

2. Individuals are most abundant from December to March, gradually decreasing until they reach a very low point in early October; from the middle of October through November they regain the winter numbers.

Norman, Oklahoma, January 10, 1927.