

Breeding Bird Populations in Payne County, Oklahoma¹

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During July, 1953, the students of the Field Ornithology class at Oklahoma Agricultural and Mechanical College made studies of breeding bird populations near Stillwater, Oklahoma. The results brought to light some interesting relationships of breeding bird populations to habitat conditions and land use practices.

PROCEDURE

The procedure closely followed that recommended by the National Audubon Society (3). Eight different study areas, one for each student, were selected in order to obtain as many different representative bird habitats as possible. Base maps, enlarged from aerial photographs, were used to plot the distribution and composition of the vegetation and to indicate the locations of bodies of water, banks, ravines, other topographic features, and all man-made structures. Each area was visited by the student assigned at least once under supervision and thereafter twice a week during July. Area IV was studied by Lawrence who also supplied considerable information pertaining to Area III. The locations of nests found and birds seen or heard were plotted on outline maps traced from the original map. At the end of the observation period all records indicating the distribution of each species were located on a final map. From this composite map the approximate territory of each individual bird was determined.

DISCUSSION OF RESULTS

NUMBERS OF BREEDING BIRDS. The relative abundance and frequency of occurrence for each species on the eight study areas are summarized in Table I. In general, the results of this study were in agreement with a similar analysis based on several hundred counts from 1939 to 1946 throughout Payne County (2). For example, the wide distribution and general abundance of the House Sparrow, Orchard Oriole, Bell's Vireo, and Carolina Chickadee were indicated both by the results of these breeding-bird censuses and the previous counts. On the other hand the results of this study did not appear to give a true picture of the status of a number of the species. For example, the colony of Purple Martins nesting in Area IV gave a badly distorted impression of the abundance of this species. Purple Martins are limited to nest boxes put up by man and are rather local in distribution. Unquestionably this species is less abundant than a number of other species which the Purple Martin outranks in Table I. The same comment can be made in the case of the Red-wing. Nesting Red-wings in Payne County are largely limited to small colonies located about ponds and lakes bordered by cattails or heavy stands of willows and other species of low-growing trees. The shore lines of most ponds in this locality are so heavily grazed and trampled by livestock that suitable nesting habitat is not available. (See Area III).

The results of these censuses likewise rate certain species too low. The Downy Woodpecker, Mockingbird, Tufted Titmouse, Lark Sparrow, and Field Sparrow are common nesting species widely distributed throughout the area. A census taken on 22 acres of timbered ravine and oak woods at Lake Carl Blackwell in 1943 more accurately portrays the status of several of these species (1). Population figures for the Downy Woodpecker and the Tufted Titmouse were 18 birds per 100 acres while the Field Sparrow, which is generally common to abundant in moderately-grazed oak woods and ravine associations, revealed a density of 55 per 100 acres in contrast

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TABLE I
Abundance and Frequency of Breeding Birds

SPECIES	NO. PER 100 ACRES	NO. OF AREAS OCCUPIED
Purple Martin (<i>Progne subis</i>)	37.5	1
House Sparrow (<i>Passer domesticus</i>)	36	4
Red-wing (<i>Agelaius phoeniceus</i>)	29	2
Orchard Oriole (<i>Icterus spurius</i>)	26	5
Bell's Vireo (<i>Vireo belli</i>)	20	4
Carolina Chickadee (<i>Parus carolinensis</i>)	19	6
Cardinal (<i>Richmondena cardinalis</i>)	15	5
Mourning Dove (<i>Zenaidura carolinensis</i>)	14	5
Brown Thrasher (<i>Toxostoma rufum</i>)	14	5
Bewick's Wren (<i>Thryomanes bewicki</i>)	9	2
Green Heron (<i>Butorides virescens</i>)	8.5	1
Dickcissel (<i>Spiza americana</i>)	8	4
Baltimore Oriole (<i>Icterus galbula</i>)	8	3
Yellow-shafted Flicker (<i>Colaptes auratus</i>)	7	3
Eastern Meadowlark (<i>Sturnella magna</i>)	7	3
Common Goldfinch (<i>Spinus tristis</i>)	7	4
Yellow Warbler (<i>Dendroica petechia</i>)	6.5	3
Eastern Kingbird (<i>Tyrannus tyrannus</i>)	6	2
Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	5.5	3
Red-bellied Woodpecker (<i>Centurus carolinus</i>)	5	2
Crested Flycatcher (<i>Myiarchus crinitus</i>)	5	2
Eastern Cowbird (<i>Molothrus ater</i>)	5	2
Eastern Bluebird (<i>Sialia sialis</i>)	4	1
Carolina Wren (<i>Thryothorus ludovicianus</i>)	4	2
Mockingbird (<i>Mimus polyglottos</i>)	4	2
Lark Sparrow (<i>Chondestes grammacus</i>)	4	1
Blue Jay (<i>Cyanocitta cristata</i>)	3.5	2
Field Sparrow (<i>Spizella pusilla</i>)	3.5	3
Warbling Vireo (<i>Vireo gilvus</i>)	3	2
Barn Swallow (<i>Hirundo rustica</i>)	2.5	1
Yellow-crowned Night Heron (<i>Nyctanassa violacea</i>)	2	1
Rough-winged Swallow (<i>Stelgidopteryx ruficollis</i>)	2	1
Tufted Titmouse (<i>Parus bicolor</i>)	2	1
Bronzed Grackle (<i>Quiscalus quiscula</i>)	2	1
Bobwhite (<i>Colinus virginianus</i>)	2	1
Starling (<i>Sturnus vulgaris</i>)	2	1
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	1	1
Downy Woodpecker (<i>Dendrocopos pubescens</i>)	1	1
Scissor-tailed Flycatcher (<i>Muscivora forficata</i>)	1	1
Eastern Wood Pewee (<i>Contopus virens</i>)	1	1
Robin (<i>Turdus migratorius</i>)	1	1
Yellow-throat (<i>Geothlypis trichas</i>)	1	1
Eastern Phoebe (<i>Sayornis phoebe</i>)	.6	1
Blue Grosbeak (<i>Guiraca caerulea</i>)	.6	1
Painted Bunting (<i>Passerina ciris</i>)	.6	1

to 3.5 per 100 acres recorded in this study. In our opinion the Lark Sparrow and the Mockingbird would undoubtedly have ranked much higher if more habitats had been sampled.

A number of fairly common nesting species were not recorded in this study. At least 80 species are known to nest in Payne County; yet only 45 of these were found breeding on the eight study areas. The fact that this study was confined to the month of July probably eliminated a few species which nest earlier in the year. Because the students were unfamiliar with the notes of owls they may have overlooked the presence of these nocturnal birds.

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Although these studies provided much information, it is apparent that eight study areas totaling 147 acres do not give a complete picture of the breeding birds of the county. Several additional types of habitat must be sampled in order to measure accurately the relative abundance of the breeding birds in an area as diversified as Payne County.

HABITAT CONDITIONS AND LAND USE PRACTICES. The eight study areas revealed considerable diversity of natural habitat and consequent bird populations (Table II). Furthermore, natural habitat conditions have been markedly changed by land use practices.

Area I included Sanborn Lake, a relatively new impoundment of about nine surface acres, which was surrounded by a heavy growth of tall grasses. Woody vegetation was limited to a narrow fringe of trees and shrubs along the water's edge. The Izaak Walton League clubhouse was the only building on the area and the landscaping is too recent to have had a marked influence upon bird life.

Due probably to the limited extent of woody cover only ten species of birds were noted to be nesting in the area (See Table III). One of these, the Red-wing, found excellent habitat conditions in the small but numerous patches of cattails. The other nine species were found only in limited numbers. The overall population density of 266 per 100 acres is considerably lower than that found on more diversified areas (Table II).

The adjoining Area II (Hazen's Pond) demonstrated what an excellent nesting habitat can be provided by a combination of water, trees, and shrubs. The total population density of 580 per 100 acres was the second highest recorded. Although the same major plant associations occurred on both Areas I and II, the latter contained much more extensive stands of dense willows, both along the shore line and growing in the shallow water over the upper third of the pond. In addition, several small sand plum thickets and patches of sumac provided nesting habitats that were largely absent on Area I. Moderate grazing had opened up the grasslands and probably improved the habitat for some bird species. The willow growths provided nesting sites for five pairs of Red-wings, one pair of Eastern Kingbirds, four pairs of Green Herons, and one pair of Yellow-crowned Night Herons. Another species associated with water was a pair of Rough-winged Swallows nesting in a bank in the pond spillway. The contrast in land bird populations was equally notable. At Hazen's Pond fifteen species of land birds were represented by one to three pairs whereas around Sanborn Lake only seven species were classified as breeding and only one pair of each was recorded.

Adjoining Areas III and IV afforded an opportunity to compare habitats that at one time, as a single homestead, must have been very similar but now, due to changes in land use, revealed several conspicuous differences. Area III (Bilyeu's Farm) included a farm pond (1.8 surface acres), a farm home and outbuildings, a small but very dense red cedar post lot, an intermittent stream bed with scattered elms, hackberries, honey locusts, green briars, etc., and nearly six acres of lightly-grazed tall grass prairie. The farmstead and pond area had been subjected to heavy grazing and trampling by livestock for many years and presented a bare open aspect interrupted only by a few large willows around the pond. The only woody growth about the farm house and buildings were two ornamental pines, five deciduous trees, and a few shrubs. The absence of trees and shrubs near the house and pond in conjunction with the rather uniform lightly-grazed prairie were believed to explain the low population of nesting birds.

Only thirteen species were found regularly on the area, giving a nesting population of 305 per 100 acres. The majority of these were associated with the intermittent stream and post lot. Not even the House Sparrow occurred in any considerable numbers (three pairs). The absence of species as-

TABLE II
Description of Areas

AREA NO.	NAME	STUDIED BY	ACREAGE	TYPE OF HABITAT	LAND USE	NO. OF BREEDING BIRDS PER 100 ACRES
I	Sanborn Lake	A. W. Hill	12	Large pond, bordered by tall grass prairie; fringe of trees, shrubs and cattails about parts of pond.	Recreation; a club house with limited ornamental plantings; no grazing.	266
II	Hazen's Pond	J. R. Preston	11	Large shallow pond bordered by tall grass prairie; upper third of pond and part of shore line grown up to thickets of willows and cottonwoods.	Stock water and irrigation; moderate grazing.	580
III	Bilyeu's Farm	W. S. Wood	12	Farm house and buildings; moderate sized farm pond; tall grass prairie, scattered trees along intermittent stream; dense red cedar post lot planting.	Farmstead, pond area and part of pasture heavily grazed and trampled by livestock; part of pasture lightly grazed; limited trees and shrubs about farm house.	305
IV	Baumgartner's Acreage	R. G. Lawrence	10	Country home; tall grass prairie intermittent stream and small farm pond bordered by scattered trees.	Four acres including house, out-buildings and small pasture ungrazed; remainder lightly grazed; extensive ornamental plantings; large martin house and numerous bird houses and feeding stations.	980
V	Adam's Farm	V. H. Edmond	20	Country home and buildings; tall grass prairie; intermittent stream bordered by some trees.	Ornamental plantings and small orchard near home; most of area heavily grazed by cattle and sheep.	300

TABLE II (Continued)
Description of Areas

AREA NO.	NAME	STUDIED BY	ACREAGE	TYPE OF HABITAT	LAND USE	NO. OF BREEDING BIRDS PER 100 ACRES
VI	Adam's Pasture	B. G. Barton	22	Chiefly tall grass prairie; intermittent stream and small shallow ravines bordered by a fringe of trees and a few shrubs.	Entire area grazed heavily; grass generally short and shrub growth limited.	73
VII	Fair Park	W. C. Greer	20	Permanent creek bordered by mature trees; tall grass prairie converted into open lawns with scattered trees and ornamental plantings.	Picnic ground; all brush cleared out; picnic tables and play ground equipment.	229
VIII	Rigdon's Pasture	J. L. Temple	40	Tall grass prairie bordered by oak woods and oak-tall grass savanna.	Trees and shrubs cleared from most of area; prolonged grazing has killed out most of the second growth trees and shrubs and largely eliminated the tall grasses; soil very severely eroded and depleted.	55

TABLE III (Continued)
 Summary of Breeding Bird Populations

SPECIES	AREA I	AREA II	AREA III	AREA IV	AREA V	AREA VI	AREA VII	AREA VIII	TOTALS
Mockingbird					2P (1N)-20	1P	1P -10		3P (1N)-30
Brown Thrasher		1P (1N)-18	1P	3P (2N)-60		1P -9	1P (1N)-10		7P (4N)-114
Robin			2P (2N)-34				1P (1N)-10		1P (1N)-10
Eastern Bluebird			1P (1N)-17						2P (2N)-34
Starling				4P (4N)-80			2P	-10	1P (1N)-17
Bell's Vireo	1P (1N)-17	3P (3N)-52							10P (8N)-159
Warbling Vireo	1UM -8	1P -18							1P, 1UM-26
Yellow Warbler	1UM -8	2P (1N)-35		1UM -10					2P (1N), 2UM-53
Yellow-throat	1UM -8								1UM -8
House Sparrow		1P (1N)-18	3P (2N)-50	5P (2N) 100	10P (8N) 100		4P (4N)-38		22P (18N)-288
Eastern Meadowlark	8P (8N), 2UM-150	5P (5N)-85	1P -17	1P -20					3P (1N)-55
Red-wing									13P (13N), 2UM-235
Orchard Oriole	1P (1N)-17	2P (1N)-52	1P (1N)-17	4P (2N)-30	2P (2N), 2UM-30				10P (7N), 2UM-196
Baltimore Oriole				1P (1N)-20	2P (2N)-20		2P (2N), 1UM-24		5P (5N), 1UM-64
Bronzed Grackle		1P (1N)-18							1P (1N)-18
Cowbird		1P -18		1P -20					3P -38
Cardinal			2P (1N)-34	3P (1N)-60	1P (1N)-10	1P -9		2P	9P (3N)-123
Blue Grosbeak						1UM -5		1P	1P -5
Painted Bunting									1UM -5
Dickcissel	1P -17	2P -35		1UM -10				1P	4P, 1UM-67
Eastern Goldfinch		1P (1Y)-18	1P (1N)-17	1UM -10	2UM -10				2P (1N), 1Y, 3UM-55
Lark Sparrow									3P (1N)-29
Field Sparrow	1UM -8			1UM -10			3P (1N)-29		2P (1N)-10
Lark Sparrow	13P, -266	32P-580	18P-305	47P, -980	28P, -300	7P, -73	23P, -229	2P (1N)-10	2P (1N), 2UM-28
Totals	6UM		4UM	4UM	4UM	2UM	1UM	11P-55	

* P=Pair of Breeding Birds
 (N)=Nest found
 (Y)=Young out of nest
 UM=Unmated Male
 Number=No. per 100 acres

sociated with water is also significant. Neither the Green Heron nor the Red-wing found the bare open pond banks suitable for their nests.

Area IV demonstrated the results of a deliberate attempt to increase the bird population about a country home. In contrast to Area III there were extensive ornamental plantings about the house, many shade trees, dense hedges, and vine-clad fences. The four acres including house, garden, outbuildings, and several small lots had been largely protected from grazing since 1947. All fence lines had tended to grow up to trees, shrubs, and vines. In addition to the sparsely-timbered intermittent stream which also lay within the area fenced to livestock several clumps of red cedars and deciduous trees such as elms and mulberries had been planted. The back pasture, continuous with that of Area III, and lightly grazed, included a very small farm pond bordered by several clumps of trees, and two shallow brushy ravines extending up the slope to the boundaries of the study area. In addition to the abundance of natural nest sites, 15 bird houses including a 24-compartment martin house had been erected on the grounds.

The total population of 980 breeding birds per 100 acres was unquestionably weighted by the presence of 15 pairs of Purple Martins whose regular feeding grounds extended far beyond the boundaries of the study area. Excluding the martins the nesting population of 680 birds per 100 acres was still significantly greater than that found on other areas despite the complete absence of species associated with water. Of the 19 species breeding in the area the majority were attracted by trees, shrubs, and vines for nesting sites. Only three, the Purple Martin, the Barn Swallow, and the House Sparrow were dependent upon man-made structures. The Bewick's Wren also used the bird houses but probably would have found satisfactory hollows in the dead limbs and stubs available in the area. The high carrying capacity of the area was also reflected in the abundance of several species found on ten acres. Some of the territories of the Carolina Chickadee, Bell's Vireo, and the Orchard Oriole had a common boundary on one or more sides. Only the Eastern Meadowlark was entirely limited to the tall grass prairie and, as usual, the nesting density of this species was low.

Areas V and VI represented a country home and small livestock farm providing a naturally favorable habitat that had been adversely affected by heavy grazing of cattle and sheep. Area V (Adam's Farm) included a country house and yard, garden, a very small family orchard, and a pasture including a section of West Boomer Creek plus an intermittent branch of this stream. The yard and farmstead had been planted rather extensively to trees, but the area and distribution of shrubs and low-growing trees was quite limited. The creek banks and the shallow ravine enclosing the intermittent branch were heavily timbered, but browsing of the lower limbs of the trees and of the shrubs had eliminated much of the understory and ground cover. The open pasture planted to Bermuda grass was closely cropped and tall grasses and forbs made a sparse growth.

Of the 12 species of breeding birds, the House Sparrow was the only one with a high nesting density. At least ten pairs were nesting in the outbuildings and trees planted near the house. The other species consisted largely of hole nesters such as the woodpeckers, Carolina Chickadee, and species such as the Mourning Dove and orioles that nest in open trees. Mockingbirds and Cardinals found suitable nesting sites in a few thorny hawthorn trees or the shrubbery about the house. Three hundred breeding birds per 100 acres indicated a fairly high density, but if the 100 House Sparrows were disregarded the population density was not impressive. Heavy grazing seems to have been the chief limiting factor in this habitat.

Area VI, consisting of 22 acres of adjoining pasture land, included most of the plant associations found on Area V, but lacked the buildings, lawn, and ornamental plantings associated with a country home. The timber and grasslands occurred in large blocks resulting in poor inter-

spersion of vegetative types. Grazing had obviously been heavy, with closely-cropped grass and severely-browsed trees and shrubs.

The estimated breeding population of 73 birds per 100 acres seems surprisingly low, but two censuses by Baumgartner did not disclose any additional information. Only six species were believed to have nested during the period of observation. The lack of records of ground-nesting species and the absence of nesting birds in the limited thickets along the fence row, indicated the weakness of this habitat.

Area VII (Fair Park) was a sample of an area developed for public recreation. Approximately half of this study ground consisted of a timbered creek bottom bordering Boomer Creek. The other half included uplands changed from their original state of a mixed timber and grasslands to mowed lawns planted to scattered rows of Chinese elms and partially enclosed by shrubs and flower beds. All underbrush had been cleared out of the bottomland creating an open park-like aspect of short grass beneath a thin stand of large pecans, burr oaks, native elms, and a few cottonwoods. Picnic tables, fire places, and play equipment had attracted enough people to eliminate all ground vegetation in the bottomland.

As shown in Table III, fourteen bird species were found breeding on this area with a total population of 229 per 100 acres. The dominance of tree and hole-nesting species, 11 of the 14, was to be expected on account of the numerous large trees. Shrub-nesters such as the Mockingbird, Brown Thrasher, and the Lark Sparrow found suitable nesting habitats in the clumps of ornamental shrubs bordering the mowed lawns. The general lack of undergrowth and the rather uniform character of large blocks of this study area are believed to explain the rather low nesting density.

Area VIII (Rigdon's Pasture) may be typical of uplands subjected to extreme abuse. Originally a rough, rolling oak-savanna, this 40-acre portion of a large pasture had been partially cleared of trees and subjected to severe overgrazing for many years. More than half of the area consisted of a continuous block of grassland enclosed by a wide border of scrubby oak woods. On the edges of the study area were the heads of three ravines containing a mixture of shrubs and trees. Cattle had browsed and trampled some of the low-growing oaks and largely eliminated the tall grasses. The area was characterized by severe erosion that had created raw gullies on the steeper slopes. In a number of places the underlying rock was exposed. The existing vegetation in the open areas consisted primarily of light to medium stands of forbs or early stages of grass succession. As a pasture improvement measure, Korean lespedeza had been sown over the area but had failed to establish itself in dense stands, probably on account of the poor chemical and physical properties of the soil. The oak woods were so dense that the trees shaded most of the ground. The combination of depleted soils, limited edges, heavy stands of scrub oak, and sparsely-vegetated grasslands provided a lamentably poor habitat for bird life.

Only eleven pairs distributed among seven species were believed to have nested on the 40-acre area, giving a total population of 55 birds per 100 acres. The distribution of these birds indicated that the heads of the ravines were the key areas. Phoebes, for example, had nested earlier in the year on a rock ledge in one ravine, and Bell's Vireos, Blue Grosbeaks, and Cardinals were apparently closely associated with the ravine heads and bordering oak woods. These observations indicate clearly that large blocks of oak woods and tall grass prairie, particularly when subjected to severe overgrazing, provide exceedingly poor habitats for nesting birds.

SUMMARY

1. A breeding-bird census of eight areas totaling 147 acres in Payne County, Oklahoma revealed a wide variation in nesting populations.
2. The results indicated that more habitats must be sampled in order to obtain accurate figures on the relative abundance of all of the nesting species. Only 45 out of 80 or more species known to nest in the county were recorded and the numerical status of a number of these did not agree with other available information.
3. Populations varied from 55 to 980 breeding birds per 100 acres.
4. Areas including a variety of habitats, particularly extensive ravine systems grown up to trees and shrubs, had a much higher carrying capacity for nesting birds than extensive prairie or scrub oak woods.
5. Land use practices appeared to be the most important factor regulating population levels. Limited grazing, the construction of ponds, extensive plantings, and the erection of bird houses provided habitats suitable for a wide variety and a large number of nesting birds. Severe over-grazing appeared to be the most detrimental practice.

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