THE 1939 NESTING SEASON OF BLUEBIRDS AT NASHVILLE, TENNESSEE

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AGAIN I have conducted the Bluebird (*Sialia sialis sialis*) nest-box project started in 1936 in Percy Warner Park in the suburbs of Nashville, Tennessee. Last year detailed results of the 1938 season were presented at the Wilson Ornithological Club meeting and later published (Laskey, 1939). The following analysis of the 1939 nesting data corroborates most of the conclusions reached last year and also indicates the effect of prevailing temperature differences on nesting activities.

This year, beginning February 16 and continuing through August, I made 55 trips to examine the boxes, representing almost 200 hours in the field. During school vacations, Arthur McMurray rendered valuable assistance. As last year, besides keeping records of the nest progress, banding the young, and removing old nests, I tried to capture and band the brooding birds.

In addition to the 38 Bluebird boxes already in place, 18 more were set out in late March and April of 1939 with the cooperation of Conrad Jamison, William Simpson, and McMurray. These boxes are in open meadows along paved roads. With two or three exceptions, they are at least 500 feet apart and are concealed from each other by the trees and narrow thickets which border the numerous meadows in the valleys and on the hillsides of this beautiful naturalistic park of 2141 acres. The boxes are larger than those placed by Mr. Musselman in the environs of Quincy, Illinois, the inside measurements being 5 x 5 x 10 inches. Experimenting with different sizes, we found that the birds are more successful in our southern climate if this roomier box is provided. There are no losses from smothering among the larger size broods, for as the nest cup becomes crowded the young move outward and flatten the entire mass of grasses with which the parents had filled the bottom of the box.

When the project was started most of the boxes were placed on posts 6 to 7 feet above the ground which necessitated carrying a ladder or climbing the post to examine the nest. This height, however, did not provide immunity from predation. Therefore to facilitate the banding of the birds and the removal of old nests, posts were cut so that boxes are now about 5 feet above the ground. To examine a nest, the top of the box is slightly raised and a small mirror is held above the opening at the proper angle to reflect the contents. Thus one does not obscure light by leaning over the opening, and the mirrored reflection reveals nest, eggs, nestlings, or brooding female clearly, eliminating unnecessary handling.

Of the 56 boxes in the park this year, 53 were occupied at least once during the season by Bluebirds, one was entirely monopolized by

House Sparrows (*Passer domesticus*), and 2 were vacant. There were 133 sets or 576 eggs laid, an average of 4.3 eggs per nest. This year there matured 290 nestlings or 50.3 per cent of the number of eggs laid. It was disappointing to find an increase of only 25 nestlings over last year's results and the percentage of successful eggs 7.3 per cent less than last year in spite of the larger number of boxes. Weather conditions seem to be an important contributing factor and there was a marked contrast between the two seasons. February and March 1938 were unusually mild with average day and night temperatures higher and with fewer fluctuations in daily range than in 1939. Vegetation was from two to three weeks in advance of that of 1939. Bluebird nesting activities also started early. Nest building began in February of 1938; a set of 4 eggs was being brooded on March 5. In 1939 nest building did not start until March; the first eggs were laid on March 18. The activitives of the Bluebird occupying Box 21 both years, raising three successful broods each season, is significant. In 1938 building of her first nest started February 23; in 1939 not until March 21. In 1938 her first egg was laid March 21; in 1939 on April 15. In 1938 her second set was started on April 28; in 1939 on June 5. For the third nesting period of 1938, her first egg was laid on June 9, but in 1939 it was on July 29. Last year she laid 14 eggs, two of which were sterile, and raised 12 nestlings. This year, she laid 15 eggs, five of which were sterile, and raised 9 young.

TABLE 1

THE NESTING PERIODS IN 1939

	First Period	Second Period	Third Period	Total
Number boxes available	49	56	56	
Number sets laid	47	50	36	133
Number with 1 egg	0	1	1	2
Number with 2 eggs	0	1	1	2
Number with 3 eggs	0	4	4	8
Number with 4 eggs	8	29	28	65
Number with 5 eggs	33	15	2	50
Number with 6 eggs	6	0	0	6
Total number eggs	233	206	137	576
Average number eggs per nest	4.95	4.1	3.8	4.3
Number sets entirely unsuccessful	17	23	19	59
Number eggs in unsuccessful sets	81	88	71	240
Number young fledged	139	99	52	290
Percentage of success based on number of eggs laid	59.7	48	38	50.3
Average young hatched per nest	3	2	1.4	2.18

Another factor which probably accounts for some of the results this year was the tardy placing of the 18 additional boxes. Bluebirds in Tennessee investigate possible nest sites on every mild day in winter

and early spring, later defending their chosen territories from other Bluebirds by fighting if necessary. For that reason the boxes placed in late March and April were not available at the nest-seeking time and only a few were used during the first period. The abundance of boxes apparently was responsible for the increasing tendency this year for a few brooding females to move to different boxes between nestings.

Percentages of success (i.e. young raised from total number of eggs laid) of the Bluebird nest box project at Nashville was found to be lower than at either Quincy, Illinois, or Cape Cod, Massachusetts. For Quincy T. E. Musselman (1935) reports as follows: 1933, 78.3 per cent; 1934, 66.6 per cent; 1935, 67.4 per cent. For Cape Cod Seth Low (1934) reports: 1932, 86.3 per cent; 1933, 64.6 per cent. In Nashville percentages for 1938 were 57.6 and 1939, 50.3.

This year 5 sets (24 eggs) of albino eggs were found. Each year there have been a few clutches of white eggs and they usually hatch successfully. So far we have traced no relationship between the various females laying such eggs. None of the offspring have been found nesting and we therefore have not been able to determine whether they lay

TABLE 2

COMPARISON OF 1938 AND 1939

	1938		1939	
	Numbers	Percentage	Numbers	Percentage
Number boxes used at least once	36		53	
Nests with 1 egg each	2	1.92	2	1.5
Nests with 2 eggs each	3	2.88	2	1.5
Nests with 3 eggs each	12	11.54	8	6.0
Nests with 4 eggs each	25	24.04	65	48.9
Nests with 5 eggs each	57	54.81	50	37.6
Nests with 6 eggs each	4	3.85	6	4.5
Nests with 7 eggs each	1	.96	0	0.
Sets of eggs laid	104	100	133	100
Total number of eggs laid	460		576	
Average number eggs per set	4.4		4.3	
Entirely unsuccessful nests	37	35.57	59	44.36
Sterile eggs	34	7.39	21	3.7
Unhatched fertile eggs	4	0.87	13	2.3
Disappeared from nest (eggs and nestlings)	103	22.39	108	18.8
Eggs deserted	18	3.91	95	16.5
Eggs and small nestlings destroyed by House Sparrows, Starlings, ants, etc.	36	7.83	49	8.4
Number nestlings leaving successfully	265	57.6	290	50.3
Average number young hatched per nest	2.54		2.18	

white or normally colored eggs. Musselman found one bird, apparently normal, that had been hatched from an albino egg returning to nest in one of his boxes and brooding a set of white eggs, thus showing that this trait may be inherited.

There were 286 eggs which either failed to hatch or which yielded nestlings that perished before fledging. Basing percentages on the total number of eggs laid, it was found that 21 or 3.7 per cent were sterile; 13 or 2.3 per cent fertile eggs did not hatch; 108 eggs and nestlings (18.8 per cent) disappeared from the nest. This included broken eggs and small dead nestlings removed by the parents as well as those taken by snakes and other predators. Thirty eggs and newly hatched nestlings were apparently destroyed by other birds for eggs were found pierced or thrown out and nestlings pecked. House Sparrows were guilty in some instances. Seven developing nestlings (1.4 per cent) were found dead in boxes, five of them when the mother bird was killed by a cat. Three July broods of hatching nestlings (2 per cent) were devoured by tiny ants. One invasion was noted at 5:30 A.M. in Box 16 as the parents flew in and out of the box in distress but made no attempt to kill the horde of ants swarming in the nest over pipped eggs and emerging nestlings. Returning a little later with pyrethrum powder and hot water, I found the parents had deserted and the dead baby birds were being rapidly devoured by the ants. Dr. M. R. Smith of the U. S. Department of Agriculture has identified these ants as *Solenopsis* sp. (*molesta* group).

Ninety-five eggs or 16.5 per cent were deserted, usually after depredations and disturbances. During the summer several park improvement projects, such as road paving and building of stone entrance gates, disturbed some of the birds. There was considerable evidence against cats which, unfortunately, are allowed to live in the park. In three or four instances, desertions may have been caused by the trapping of the brooding bird or by interference from casual park visitors.

Nest boxes placed at a distance from human habitations are more successful than those in close proximity to house or barns. Although Bluebirds learn to ignore passing automobiles when boxes are placed in meadows along highways, they seem more easily disturbed by activities around a home and seldom adapt themselves to noises and movements of a household as do Mockingbirds, Robins, and Cardinals. Around houses and barnyards they suffer much interference from House Sparrows. In the residential section of Nashville, landscaped city lots attract several species for nesting, but a box placed for Bluebirds on the lawn is rarely used. This point is well illustrated by the environment of our own home. A few years ago when the area was sparsely built, Bluebirds were numerous, but as the encroaching city is absorbing the vacant acreage with rows of houses, the birds are seen in smaller numbers, and most of the nest boxes remain unoccupied.

As in 1938 early nests were more successful than subsequent nestings. In both seasons, the first nesting period yielded a higher percentage of success than the second period, and the third period was lower than the second. The total number of eggs laid and the average number per nest decreased in each later period of both years. When analyzing the

nesting success of Bluebirds in Quincy, Illinois, where the species is a summer resident and has only two nesting periods per season, Musselman found that the first period was often more successful. In 1933 and 1934 the first period yielded a higher percentage of success than the second, but in 1935 the situation was reversed on account of a disastrous freeze in April. He says: "In spite of the drouth which caused material damage in the second nesting in 1934, the totals were similar (to those of 1933) but the rains, snow, and freeze of 1935 produced poor results in the first nesting, with birds more constant in the second nesting than usual."

TABLE 3

THE THREE NESTING PERIODS IN 1938 AND 1939 [1]

	1938			1939		
	1st	2nd	3rd	1st	2nd	3rd
Start of earliest nest	Feb. 23	Apr. 19	May 25	Mar. 2	May 1	June 15–
Start of latest nest	Mar. 23	May 19	July 4	Mar. 25	June 14	July 24
Nestlings fledged	123	90	52	139	99	52
Percentage of success	72.3	55.2	42.6	59.7	48	38

[1] In 1938 a fourth nesting period was attempted with two nests; July 23, 1 egg laid and deserted; July 25, 4 eggs, 1 nestling hatched but was found dead August 8. In 1939 there was no fourth attempt.

In compiling these dates I used only those that I was reasonably certain were of the same pairs in their respective boxes, progressing in a normal manner without interference from predators or disturbances. The pairs that started earliest with their first nest would be expected to complete their third brood earliest, but there is also a difference among individuals in the time elapsing between broods.

Some experimenting was attempted with deserted eggs. At various times five sets of marked eggs were transferred to other nests where small sets of approximately the same age were being brooded. These additions were accepted by the mother birds. Two sets of the transferred eggs disappeared with the original eggs of two nests. Two sets were either sterile or had been chilled before transferring; one of these sets had been substituted for House Sparrow eggs just being laid. Both male and female sparrows brooded them for twelve days before deserting. One set of two eggs was hatched by the foster mother on the same day as her own. This proved to be a fortunate arrangement, for although three of her four eggs were sterile, the pair successfully raised three young.

During a severe rainstorm a Robin's nest with two nestlings was blown down. The larger young one survived the fall of 20 feet and was then placed in a Warner Park Bluebird box with three nestlings at about the same stage of plumage development. This Robin was well fed by the Bluebirds, but on the sixth day of its adoption when the fledglings left the nest, it also hopped out although unable to fly and still weak on its legs. The distressed parent Bluebirds were found in a tree near the

nest-box apparently attempting to call it to them from the grassy rut in which it squatted and called. Fearing they might neglect their own young for this helpless Robin, I brought it home and successfully raised it by hand.

In 1939 brooding females in 66 per cent of the 134 nesting attempts were identified. One bird was taken on an unused nest, the others while brooding. From the banding records and recaptures of this group of 67 individuals I obtained additional data on the relative faithfulness of brooding birds to their chosen nest sites. There were recaptured 13 that had been banded in the park in previous years, and 8 of them were occupying the same boxes in which they had been banded. The occupants of Boxes 9 and 22 were using them for the third consecutive year. Nine of them had been banded as nestlings in the park, and 45 were new birds not banded until this year. During the three nesting periods of the season 17 brooding females are known to have used their respective boxes for either two or three nests. A few were found to have moved to boxes in adjoining meadows for subsequent nestings. These moves, however, usually followed an unsuccessful nest.

At my home a female Bluebird (34-172784) banded in April 1936 was found occupying the same box for her fourth year.

As in 1938 no males were found brooding in the park.

On analyzing the nesting data, I found that an egg was laid daily until completion of the set. Apparently incubation started with the laying of the last egg of the clutch. Most broods hatched in 13 or 14 days. In three cases where the entire set proved to be sterile or embryos had perished at an early stage of development, the females incubated 21 days before deserting.

Nestlings remained in the boxes from 14 to 16 days, usually the latter period. Power of flight was well developed by that time. Young leaving the box were observed flying successfully from the entrance to trees at least 100 yards away. Twice, newly hatched nestlings were seen raising the head with wide open mouth even before the natal down had dried.

Reviewing the record of nestlings, I found that of the 521 that apparently fledged successfully in the past three years, 15 females have been found breeding in the park and several males have been seen there, identified by sight as nestlings because they had been banded on the left tarsus. This season 6 females or 2.2 per cent of the 265 nestlings banded in 1938, were found breeding in the park, and there were 3 that had been banded in 1937. If captures of the males had been possible, the percentage probably would have been doubled. Low (1934) found that out of 142 nestlings banded in 1932, 4 birds (2 male, 2 female) or 2.8 per cent returned to nest in 1933.

Two immature Bluebirds which had been banded as nestlings were found dead in the park and one was found three miles north.

At the beginning of each spring season, one or two males have been found dead from injuries in or under Boxes 1 and 2. House Sparrows occasionally attempt to nest in these boxes and doubtless have fought some of the males. However on February 16, 1939, when there were no House Sparrows in the vicinity, we found in an empty box (No. 1) a male Bluebird that had recently died. The dead bird was removed and left on a small stepladder underneath while another box was visited. From a distance it was noted that a male Bluebird repeatedly attacked it, knocking it to the ground and continuing the attack there.

Only four nests were found in the park built in places other than the boxes provided. Two were in a peach tree cavity, one in a stone cavity of an entrance gate post, and the other in a tin newspaper box. These nests, totalling 18 eggs, were 39 per cent successful, yielding only 7 young.

Preparations for the 1940 season have been completed in December, 1939. A few additional boxes have been placed in the adjoining Edwin Warner Park and a number of the less successful boxes in Percy Warner Park have been moved to other locations in a section not previously supplied with boxes. In addition several small boxes have been placed in the wooded sections to attract chickadees, titmice, and wrens. Some experimenting is being done with cat or snake guards. A number of the posts have been equipped with bands of metal that have been cut to have a flaring, fringed edge which it is hoped will deter predators from climbing to the boxes.

Summary

Bluebirds, permanent residents in Tennessee, have long nesting seasons, beginning in February and lasting into September. The seasons are divided into at least three nesting periods.

Early nests have a higher percentage of success than those of later periods; the average number of eggs in a set decreases in each subsequent period; the number of entirely unsuccessful nests also increases in later periods. As the season advances there are increasing numbers of predators robbing nests for food; there are more disturbances due to human activities during summer, causing desertions and disastrously long absences of parents from nests. It is possible that extreme heat affects eggs adversely and also weakens newly hatched chicks.

Five out of 133 sets of eggs were white instead of normally colored.

Boxes placed in suitable open situations are quickly taken. Meadows are favored nest sites. Apparently boxes should be several hundred feet apart to allow sufficient territory for each breeding pair. They should be set out in winter because nest sites are investigated by Bluebirds on mild days throughout the cold season and territorial defense starts in early spring.

Faithfulness to the chosen nest site is a common trait of females and probably of males also. The same site may be used for the entire sea-

son and from year to year unless depredations or other disturbances occur.

Nest boxes placed at a distance from human habitations are more successful than those nearby. Bluebirds are easily disturbed by activities around a home and unlike some species, seldom adapt themselves to noises and movements of a household. Both male and female carry material into the box. Incubation and brooding in all nests is by the female; feeding and caring for the young by both parents. Incubation period usually is 13 to 14 days but occasionally extended to 16 days after laying of the last egg of the set. Young may leave on the fourteenth day after hatching but usually on the sixteenth.

In 1939 Bluebirds used 53 of the 56 available boxes in Percy Warner Park, laying 576 eggs (133 sets), an average of 4.3 per set. From these there matured 290 nestlings, or 50.3 per cent of the number of eggs laid.

Literature Cited

Laskey, Amelia R.
1939 A Study of Nesting Eastern Bluebirds. *Bird-Banding,* 10: 23–32.

Low, Seth H.
1934 Bluebird Studies on Cape Cod. *Bird-Banding,* 5: 39–41.

Musselman, T. E.
1935 Three Years of Eastern Bluebird Banding and Study. *Bird-Banding,* 6: 117–125.
1939 The Effect of Cold Snaps upon the Nesting of the Eastern Bluebird (*Sialia sialis sialis*). *Bird-Banding,* 10: 33–35.

Graybar Lane, Nashville, Tennessee

Texas Bird Adventures in the Chisos Mountains and on the Northern Plains. By Herbert Brandt. Bird Research Foundation, 11945 Carlton Road, Cleveland, O., 1940: 5¾ x 8½ in., xi + 192 pp., 16 pls. $3.00.

This is a highly colored account of an excursion which the Texas Game, Fish and Oyster Commission licensed as a scientific expedition. The book is marred by much repetition, by many examples of the pathetic fallacy, and by numerous anthropomorphisms—all expressed in a strangely stilted phraseology. Most of the "discoveries" of which we are told have been published by others in the dozen scientific papers concerning the birds of the region which appeared between 1902 and 1937.

In the field (even if not in this book) the author's romantic imaginings seem to have been contagious. The morning of their start into the mountains "the horses themselves seemed to reflect our human excitement" (p. 55), and by the fourth night even their "soft-spoken rancher guide" on retiring "placed his .45 six-shooter and .30-.30 carbine beside his blankets, so that they could be easily reached if necessary in the night." (p. 103).

In addition to several interesting photographs, there are eleven illustrations by George M. Sutton. Two of the Sutton pictures are pen-and-ink drawings done especially for this book and the others are black and white reproductions of water-color portraits of birds made in the field in the Chisos Mountain region in 1935. In spite of the loss of the color which made the originals so charming, these bird portraits remain very effective interpretations of these species and assure the book a permanent worth.—J. Van Tyne.