Nesting Results and Initial Habitat Assessment of the Nesting Box Trail for *Sialia sialis* (Eastern Bluebird) In the Powell River Project Education Center Year 2: Expansion

C. A. Burkart[1], A. Russo[1], L. Clayton[1], T.J. Davis[2], V. Fleming[2], J. Genco[3], S. Lane[2] and J. Mays[2]

Abstract

The nesting box trail for the Eastern Blue Bird was expanded to a second field that is part of the Powell River Education Center. The new sites consist of paired boxes with the same design as the boxes used the first year of the study; each pair consisted of one box with a solid roof and one with a screen roof. During the 2008 nesting season (March to July), nesting activity was again limited to the closed top boxes. Bluebirds produced nests in both fields, but only nests in the original field were successful in fledging young. At the end of the season, a total of eight (8) bluebird chicks were fledged. Student volunteers and an administrator from the Mountain Empire Community College assisted in mounting the new boxes, monitoring activity and collecting insect samples.

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[1]Biology Department, Mountain Empire Community College, 3441 Mountain Empire Road, Big Stone Gap, VA, 24219.
[2]Mountain Empire Community College student volunteers.
[3]Director of Career Services, Mountain Empire Community College, 3441 Mountain Empire Road, Big Stone Gap, VA, 24219.

Introduction

During the second year of the project, the bluebird trail established at the Powell River Education Center was expanded to a second field just north of the original trail located adjacent to the Powell River Education Center. The addition of five sets of boxes brought the total to thirteen nesting sites. Student volunteers mounted the new nesting boxes, participated in monitoring nesting activity and collected insect samples. It was expected that with the increase in the number of nesting sites, that there would be an increase in nesting activity to test nesting box design preference, however nesting activity was light.

Methods

Nesting box preference- The objective of this study was to test whether bluebirds have a preference for the open or closed boxes. Each nesting box site consisted of two boxes, one traditional box with the closed top (Figure 1a) and a second box with an screen top that allows the elements in but keeps predators out (Figure 1b). The nests were monitored using the protocols of the Virginia Bluebird Society (Virginia Bluebird Trail Monitoring Information, 2006) and the North American Blue Bird Society (Fact Sheet: Monitoring Bluebird Nest Boxes, 2002).

a. b.

Figure 1. (a) Closed and (b) open topped nesting boxes.

For the second year of the study, we expanded the study area by adding five boxes of each design along the fence that surrounds the field located just north of the original study site (figure 2). Boxes were mounted on fence posts that supported the electrical fence surrounding the pasture. Because tree swallows (*Tachycineta bicolor*) are common cavity nesters around the project, boxes were paired within an area to reduce interspecies competition for nesting space (Wildlife: Eastern Bluebird, 2006).

Figure 2: Location of field 1 adjacent to the barn (B) and field 2. (Image from Microsoft Virtual Earth.)

Boxes were monitored for activity on a weekly basis between April 10 and July 18, 2008 following the protocols established by the North American Bluebird Society (Fact Sheet: Monitoring Bluebird Nest Boxes, 2002) and the Virginia Bluebird Society (Virginia Bluebird Trail Monitoring Information, 2006). Data was recorded on forms provided on the Virginia Bluebird Society website.

Survey of insect and invertebrate populations. Insects and other invertebrates were sampled using passive pan traps, substrate sampling (surface and soil), and insect nets along 30 m transects. Sample sites are indicated in figures 3 and 4. Pan traps were placed outside the fences to prevent injury to cattle, while substrate sampling and transect sampling took place inside the fence lines. Pan traps consisted of 13 in x 9 in metal cake pans sprayed yellow to attract a large variety of insects (figure 5a; Terrestrial Arthropod Densities, 1994), and placed flush with the substrate. The pans were filled with a soap and salt solution, which acted as a trap and as a temporary preservative. The traps remained in place for seven days after which specimens were collected by pouring the contents of the pan though a strainer. The specimens were rinsed with water and placed in 80% ethanol. Soil removed during placement of the pan traps was placed in plastic bags to determine composition of soil fauna. Unlike the previous year, soil samples were moist so samples were transferred to funnels constructed from water bottles and placed in sample jars containing the soap/salt solution. Samples sat for a week to allow them to dry; as the soil dried the specimens moved down into the jars. The soil samples were sifted to collect insects any specimens that remained in the samples. Surface samples (on soil surface and on plants) were collected within a 1 m quadrat (figure 5b) and placed in sample jars containing 80% ethanol. Animals were also collected along 30 m transects by sweeping vegetation with an insect net (figure 5c; Perry et al, 2001), and transferred to a jar containing 80% ethanol. Specimens were

identified and grouped into groups using the National Audubon Society Field Guides to North American Insects and Butterflies.

Figure 3. Field 1: Nesting box sites indicated by numbers. Soil, pan and surface sample locations indicated by □'s. Transcect locations indicated by dashed lines (----). (Image from Microsoft Virtual Earth.)

Figure 4. Field 2: Nesting box sites indicated by numbers. Soil, pan and surface sample locations indicated by □'s. Transcect locations indicated by dashed lines (----). (Image from Microsoft Virtual Earth.)

Figure 5. (a) L. Clayton placing a pan trap; (b) L. Clayton, J. Genco and C. Burkart collecting specimens from a $1m^2$ quadrat; and (c) J. Genco collecting specimens along a 30 m transect line.

Results

Nesting activity: Just as in the previous year, bluebirds built nests only in the closed top boxes (Table 1). Bluebird nesting activity (complete nest with two eggs) was first observed on April 17 in box 7A. A total of five eggs was observed and hatched, but on May 15 the chicks were found dead. The loss may have been weather related; weather data collected at NOAA weather station KLNP located at the airport at Wise VA indicated that a cold front passes through the area earlier in the week (May 10-12) (Weather Underground, 2008). Over this period, barometric pressure dropped from a high of 29.93 in. on May 10 to a low of 29.41 in. on May 11 (the lowest of the month). Humidity during this period reached 100% suggesting precipitation. Average daily temperatures dropped 10^o F from May 11 to May 12. Early morning lows dropped from 51^o F on May 11 to 39^o F on May 13. Wind gusts recorded during this time reached 48 mph and 37 mph for May 11 and 12, respectively.

Eggs were also laid in box 13 A in field 2 during early May (May 5-9), but on May 15, the box was open and the eggs were gone. In addition to the missing eggs from box 13 A, the top was pulled off box 9 A. It is possible that the damage was a result of vandalism, but it is more likely that it was a black bear; a bear does live in the area and has been known to come into the Powell River Education Center (J. Rockett, per. comm.). There was no further nesting activity recorded in this box.

Bluebird nesting activity started again in June, but only in boxes 4 A and 5 A. On June 16, a female bluebird was observed incubating eggs in box 4 A, but the number of eggs was not determined because she did not leave the nest. On July 11, four chicks were found in the box, and by July 18 they had all fledged. On June 2, five eggs were observed in box 5 A, but were gone on June 9. On June 16, a new clutch of five eggs was found in the box. By July 11, four of the five eggs had hatch and by July 18, the chicks had fledged.

Box	Species	# of Eggs	# of Hatchlings	# Fledged
1 A	--	0	0	0
1 B	--	0	0	0
2 A	--	0	0	0
2 B	--	0	0	0
3 A	--	0	0	0
3 B	--	0	0	0
4 A	BB	?	4	4
4 B	--	0	0	0
5 A	BB	10	4	4
5 B	--	0	0	0
6 A	--	0	0	0
6 B	--	0	0	0
7 A	BB	5	0	0
7 B	--	0	0	0
8 A	--	0	0	0
9 A	--	0	0	0
9 B	--	0	0	0
10 A	--	0	0	0
10 B	--	0	0	0
11 A	--	0	0	0
11 B	--	0	0	0
12 A	--	0	0	0
12 B	--	0	0	0
13 A	BB	5	0	0
13 B	--	0	0	0

Table 1. Nesting results for the 2008 nesting season. (A: closed top box; B: open top box; BB: bluebirds).

Unlike the previous year, tree sparrows did not nest in any of the boxes. In April, dead tree swallows had been found in box 5 A (one each on April 17 and 25), and in box 8 A (April 10). Because box 5 A had been a favored nesting site the previous year, the box was replaced in case of disease or contamination. Tree swallows were not observed in the boxes for the remainder of the season.

Flora: Grasses are the most common plants found in both fields, however, grass height varied between the two fields. Large sections of field 1 (between boxes 1, 2, 5 and 8) had relatively short grass (mowed to approximately 40 cm), while the grass in the remainder of field 1 and in all of field 2 was as tall as 120 cm.

Insect and invertebrate survey: Insects and other invertebrates were sampled by four methods [insect net, pan trap, soil sample and quadrat (Tables 2-5)]. A total of 9480 specimens were identified. The largest numbers of specimens were collected by the pan traps and by transect sampling. Specimens were identified and placed into one of twenty-five invertebrate groups using Milne et al. (2005). In addition to the invertebrates, salamanders were collected in pan traps 1, 2, 4 and 6.

Group	**30 m Transects**						
	Field 1				**Field 2**		
	1	**2**	**3**	**4**	**5**	**6**	**7**
Ants	0	0	1	0	0	1	0
Aphids	0	0	10	0	0	0	0
Bees	5	11	24	60	219	783	179
Beetles	2	32	17	28	9	9	3
Butterflies	0	1	0	0	1	0	0
Caterpillars	0	1	1	1	0	0	0
Centipedes	0	0	0	0	0	0	0
Crickets	4	6	2	1	0	0	0
Dragonflies	0	0	0	0	0	1	1
Earwigs	0	0	0	0	0	0	0
Flies	23	40	24	29	19	33	17
Grasshoppers	4	102	2	44	17	37	12
Lacewing	0	0	0	0	0	2	1
Leafhoppers	77	99	45	47	20	81	18
Long-legged seed bug	0	0	0	0	0	0	0
Millipedes	0	0	0	0	0	0	0
Mosquitoes	0	1	5	1	0	2	0
Moths	0	3	0	3	0	0	0
Mill bugs	0	0	0	0	0	0	0
Slugs	0	0	0	0	0	0	0
Snails	0	0	0	0	0	0	0
Spiders	2	3	9	18	6	9	2
Ticks	0	0	0	0	0	0	0
Wasps	0	1	4	0	0	25	7
Weevils	0	4	2	0	0	3	1

Table 2. Results of insect and invertebrate transect surveys conducted July 11 (field 1) and July 18 (field 2), 2008.

	Pan Traps						
	Field 1				Field 2		
Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ants	48	81	14	13	32	33	18
Aphids	0	0	0	0	0	0	2
Bees	33	31	34	47	56	56	28
Beetles	61	69	78	148	28	39	23
Butterflies	3	0	0	1	2	0	0
Caterpillars	0	0	2	0	0	0	1
Centipedes	2	1	0	0	3	1	0
Crickets	7	26	29	15	17	13	6
Dragonflies	0	0	0	0	0	0	0
Earwigs	0	0	1	0	0	0	0
Flies	58	110	83	151	73	71	115
Grasshoppers	16	14	21	16	29	28	5
Lacewing	1	0	0	0	2	0	2
Leafhoppers	120	765	213	139	295	506	90
Long-legged seed bugs	0	0	12	0	0	0	0
Millipedes	0	0	1	0	1	2	0
Mosquitoes	1	3	16	2	1	2	8
Moths	0	2	2	0	0	3	4
Mill bugs	0	0	1	1	4	0	0
Slugs	0	1	0	0	0	0	0
Snails	0	12	1	1	0	0	0
Spiders	17	61	7	6	5	13	1
Ticks	0	0	2	0	1	0	0
Wasps	4	11	31	18	24	18	34
Weevils	2	1	1	4	7	9	0

Table 3. Results of insect and invertebrate pan surveys conducted between July 11 and 18 (field 1) and July 18 and 25 (field 2), 2008.

Group	Soil Samples						
	Field 1				Field 2		
	1	2	3	4	5	6	7
Ants	0	0	0	0	0	0	0
Aphids	0	0	0	0	0	0	0
Bees	0	0	0	0	0	0	0
Beetles	0	1	0	0	0	2	1
Butterflies	0	0	0	0	0	0	0
Caterpillars	0	0	0	0	0	0	0
Centipedes	0	0	0	0	0	0	0
Crickets	0	0	0	0	0	0	0
Dragonflies	0	0	0	0	0	0	0
Earwigs	0	0	0	0	0	0	0
Flies	0	0	0	0	0	0	0
Grasshoppers	0	0	0	0	0	0	0
Lacewing	0	0	0	0	0	0	0
Leafhoppers	0	0	0	0	0	0	0
Long-legged seed bug	0	0	0	0	0	0	0
Millipedes	0	0	0	0	0	0	0
Mosquitoes	0	0	0	0	0	0	0
Moths	0	0	0	0	0	0	0
Mill bugs	0	0	0	0	0	0	0
Slugs	0	0	0	0	0	0	0
Snails	0	0	0	0	0	1	0
Spiders	0	0	0	0	0	0	0
Ticks	0	0	0	0	0	0	0
Wasps	0	0	0	0	0	0	0
Weevils	0	0	0	0	0	0	0

Table 4. Results of insect and invertebrate soil surveys conducted July 11 (field 1) and July 18 (field 2), 2008.

Group	Surface Samples						
	Field 1				Field 2		
	1	2	3	4	5	6	7
Ants	0	0	0	0	1	1	1
Aphids	0	0	0	0	0	0	0
Bees	0	0	0	0	1	1	0
Beetles	3	0	3	0	4	0	0
Butterflies	0	0	0	0	0	0	0
Caterpillars	0	0	0	0	1	0	0
Centipedes	0	0	0	1	0	0	0
Crickets	0	0	0	1	0	0	0
Dragonflies	0	0	0	0	0	0	0
Earwigs	0	0	0	0	0	0	0
Flies	2	0	1	0	0	0	0
Grasshoppers	0	0	0	0	3	1	0
Lacewing	0	0	0	0	0	0	0
Leafhoppers	2	1	0	3	1	1	3
Long-legged seed bugs	0	0	0	0	0	0	0
Millipedes	0	0	0	1	1	0	0
Mosquitoes	0	0	0	2	0	0	0
Moths	0	0	0	0	0	0	0
Mill bugs	1	0	0	0	0	0	0
Slugs	0	0	0	0	0	0	0
Snails	0	1	0	0	0	1	1
Spiders	2	0	0	1	0	1	0
Ticks	0	0	0	2	0	0	0
Wasps	0	0	0	0	0	0	0
Weevils	0	0	0	0	0	0	0

Table 5. Results of insect and invertebrate surface surveys conducted July 11 (field 1) and July 18 (field 2), 2008. Samples were collected from 1 m^2 quadrats.

Discussion: From the results of the 2007 and the 2008 nesting season, it can be concluded that bluebirds prefer closed topped nesting boxes over the present open design. For the 2009 season, open boxes will be modified with an awning to provide shade, without compromising the open design. The pattern of nesting box site use is more difficult to determine, however it may have less to do with the distribution of insects and invertebrates (figure 6) and more with the characteristics of the grasses around the boxes. Arthropods that often make up the largest proportions of the bluebird diet include: grasshoppers, crickets, butterflies, moths, spiders, beetles and leafhoppers (Sullivan, 1995). These arthropods were found in abundance at most of the sample sites (sums for these groups at each site: site 1 = 312, site 2 = 1184, site 3 = 428, site 4 = 470, site 5 = 434, site 6 = 742, site 7 = 168). Bluebirds hunt insects by perching on a branch or wire in areas with sparse or mowed grass; when an insect is located the bird will dive onto ground to catch the prey item (Sullivan, 1995). The boxes that have had the most nesting activity during both seasons (i.e.: 3 A during the 2007 season, 4 A and 5 A during the 2007 and 2008 seasons), are the boxes closest to the areas where grass is shortest due to frequent mowing (boxes

4 A and 5 A) or the grass at maturity is relatively short (40 cm by box 3A) in comparison to grass found in other locations (120 cm in field 2).

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