

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

**C. A. Burkart<sup>1</sup>, A. Russo<sup>1</sup>, J. Church<sup>2</sup>, G. Brooks<sup>2</sup>, J. Collins<sup>2</sup>, S. Collins<sup>2</sup>,  
A. Christian<sup>2</sup>, M. Head<sup>2</sup>, A. Rutherford<sup>2</sup>, and Evan Reynolds<sup>3</sup>**

**Abstract**

A nesting box trail for the Eastern Blue Bird was established along the fence line adjacent to the barn located at the Powell River Education Center. The trail consisted of eight pairs of boxes. Each pair consisted of one box with a solid roof and one with a screen roof which left the box open to the elements, but protected the birds from predators. Boxes with the open box design can be found on the market and are advertised as a way to discourage house sparrows. During the 2007 nesting season (March to July), nesting activity was limited to the closed top boxes. To date, five (5) bluebird chicks and nine (9) tree swallow chicks have been fledged. At present, one nest is active. In addition to testing nest preference, students from the Mountain Empire 2007 Governor's School collecting insect samples and surveyed plant species in order to assess the habitat quality at four locations along the trail.

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<sup>1</sup>Biology Department, Mountain Empire Community College, 3441 Mountain Empire Road, Big Stone Gap, VA, 24219.

<sup>2</sup>Students who participated in the Natural History of Southwestern Virginia strand of Mountain Empire Community College Governor's School 2007.

<sup>3</sup>Teaching Assistant for the Natural History of Southwestern Virginia strand of Mountain Empire Community College Governor's School 2007.

## Introduction

Eastern Bluebird (*Sialia sialis*) populations have been in decline from the late 1800's to the 1980's (Wildlife in Conn. Informational Series: Eastern Bluebird *Sialia sialis*, 1997). Recent decline in some areas has been as much as 90% (Fimbil, 2006). Causes for the decline include loss of habitat, lack of nesting cavities, changes in land use, pesticides and competition from both house sparrows (*Passer domesticus*) and European starlings (*Sturnus vulgaris*). The placement of nesting boxes in appropriate habitats has helped reverse the decline in bluebird numbers [Fimbil, 2006; Eastern Bluebird (*Sialia sialis*), 1999; Wildlife in Conn. Informational Series: Eastern Bluebird *Sialia sialis*, 1997]. The open fields with scattered trees and nearby water make the Powell River Project Education Center ideal for the establishment of a bluebird trail.

A trail was established at the center provide nesting sites for the birds and an opportunity for both community college and Governor's School students to participate in scientific research. Students participated in monitoring nesting activity to test nesting box preference, identifying and mapping vegetation and assessing the local insect populations.

## Methods

*Nesting box preference-* The typical bluebird box is enclosed on all sides with an entrance hole 3.8 cm in diameter (Figure 1a). These boxes are suitable for a variety of species including house wrens, chickadees, and tree swallows. These are native birds and under 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), the nests of these species should be allowed to remain in the boxes and monitored. The house sparrow, on the other hand is a non-native species, and under the protocols of both bluebird societies their nests should be removed from the boxes and the eggs, chicks and males destroyed. Bluebird houses that have only a screen at the top rather than a solid roof, and are open to the elements are said to discourage house sparrow occupation (Figure 1b). The open design appears not to discourage bluebird nesting (Native America Catalog, 2006). The objective this study was to test whether bluebirds have a preference for the open or closed boxes.

a.



b.



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

Seven boxes of each design were mounted on fence posts that supported the electrical fence surrounding the pasture adjacent to the barn at the Powell River Educational Center. An eighth pair of boxes was attached to posts inside the fence line (Figure 2). Pairing of boxes within an area is recommended to reduce competition from tree swallows (*Tachycineta bicolor*), which will use one box and protect the territory from other nesting pairs (Wildlife: Eastern Bluebird, 2006).



Figure 2. Nesting box sites indicated by numbers. Soil, pan and quadrat sample locations indicated by X's. Transect locations indicated by dashed lines (----).

Boxes were monitored for activity on a weekly basis, according to 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.

*Mapping resources along the nesting box trail.* Plant species were collected for identification at each nesting site in order to assess the quality of the area around each box as bluebird habitat. Specimens were returned to the lab at MECC where Governor's School students identified plants using the National Audubon Society Field Guides to North American Trees and Wildflowers.

*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. Samples were collected at four locations (Figure 2). Sample site 1 was located between nests 1 and 2, site 2 was between boxes 7 and 8, site 3 was located between boxes 5 and 6, and site 4 was located between boxes 4 and 5. Pan traps consisted of 13 in x 9 in metal cake pans sprayed yellow (best color for attracting a large variety of insects; 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 were emptied after one week, the specimens 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. Soil samples were stored in a freezer until they were processed by sifting the soil through a screen. Surface samples (on soil surface and on plants) were collected within a 1 m quadrat and placed in sample jars containing 80% ethanol. Animals were also collected along 30 m transects by sweeping vegetation with an insect net (Perry et al, 2001), and transferred to a jar containing 80% ethanol. Governor's school students identified specimens using the National Audubon Society Field Guides to North American Insects and Butterflies.

## **Results**

*Nesting activity:* At the point that this report was written (July 2007), the nesting season was still ongoing. At that point, nesting activity had only occurred in closed top boxes. The only activity in open boxes was that of wasps and spiders which were removed when encountered. Nesting activity by bluebirds and/or tree swallows was observed in boxes 3A, 4A, 5A, 6A and 7A. Boxes 1A, 2A and 8A had only wasp and spider activity. A bluebird established a nest in box 3A early in the season, but abandoned the nest before eggs were laid. A tree swallow pair took over the site and successfully fledged 4 of 5 nestlings. Box 4A also had bluebird activity early in the season. Five eggs were laid; however, all were abandoned. A pair of tree swallows took over the nest and successfully fledged 5 nestlings. Bluebirds laid 5 eggs in box 5A and fledged 5 young by the beginning of June. The nest was removed due to a fly infestation; later that month bluebirds built a second nest and laid 5 eggs. Box 6A had 5 bluebird eggs in late May, but the eggs disappeared before the mid-June survey. Box 7A had a bluebird pair established a nest and lay 2 eggs; however the eggs were abandoned. No additional activity was observed in 7A after the eggs were abandoned.

*Plant Survey:* Leaf and flower samples were collected around each of the nesting sites. A total of thirty-six species of trees and thirty-two species of flowers were identified around the trail (Table 1). Species distribution varied from site to site. Broadleaf trees and blackberry bushes bordered nesting sites 1 and 2, while nesting site 3 was bordered by blackberry bushes and grasses. Butterfly bushes and grasses dominated the area around site 4. The boxes at site 5 faced a grove of fruit trees; a collection of tall bushes were to the east of the boxes. Site 6 is the closest to the main road where blackberry and butterfly bushes are abundant. Site 7 is located near two stands of pines on the outside of the fence line and Christmas trees on the inside of the fence. Site 8 is surrounded mostly by grasses.

**Table 1.** Results of plant survey conducted June 18, 2007.

<b>Trees and Bushes</b>	<b>Sites</b>							
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
Apple					X			
American Basswood		X						
Balsam Fur							X	
Black Walnut				X	X			
Box elder				X				
Carolina Silverbell	X							
Cherry				X				
Chinkapin Oak	X							
Common Persimmon					X			
Crack Willow					X		X	
Alternate-leaf Dogwood						X		
Easter Burning bush			X					
Eastern Hemlock		X						
European Black Alder					X			
Fraser	X							
Green Ash					X			
Hawthorn						X		
Honey Locust						X	X	
Magnolia	X							
Possumhaw								
Viburnum	X							
Red Bud							X	
Red Maple	X		X	X	X		X	
Red Oak					X	X		
Rosebay								
Rhododendron	X	X						
Royal Paulownia								X
Sassafras	X							
September Elm	X	X						
Shortleaf Pine							X	
Silver Maple						X		
Smooth Sumac			X					
Southern Red cedar								X
Staghorn Sumac				X	X			
Sycamore				X	X		X	
Virginia Sterwartia		X						
Winged Elm	X							
Yellow Poplar	X	X	X					

Table 1 (Cont.)

Other plants	Sites							
	1	2	3	4	5	6	7	8
Agrimony			X					
Beetleweed			X					
Birdsfoot Trefoil				X				
Blackberry	X	X	X	X	X	X	X	
Black Cohash			X					
Black-eyed Susan					X			
Butterfly Bush				X				
Clematis							X	
Common Cattail						X		
Common Milkweed						X		
Common Plantain								X
Crown Vetch		X			X			
Daisy Fleabane					X	X		X
Deptford Pink	X		X	X	X		X	X
Fern		X						
Goatsbeard					X	X	X	
Great Ragweed		X				X		
Indian Hemp						X	X	
Oxeye Daisy				X				
Philadelphia Fleabane		X						
Pigweed								X
Poison Ivy				X		X	X	
Pricley Lettuce	X							
Queen Ann's Lace	X			X	X		X	
Red Clover	X		X	X	X	X		X
Swamp Buttercup	X		X					X
Thistles	X				X	X	X	
Thorny Pigweed								X
Virginia Creeper							X	
Virginia Rose					X		X	
White Daisy	X							
Yellow Sweet Clover				X	X	X	X	

*Insect and invertebrate survey:* Insects and other invertebrates were sampled by four methods (insect net, pan, soil sample and quadrat). A total of 1175 specimens were identified (Table 2). The largest numbers of specimens were collected by the pans, which was expected because the pans remained in place for one week. Specimens were identified and placed into one of twenty-three groups.

Table 2. Results of insect and invertebrate survey conducted June 15 and June 21, 2007.

Group	Transect				Pan			
	1	2	3	4	1	2	3	4
Ants	0	0	0	0	0	7	6	0
Bees	0	0	0	0	23	176	248	171
Beetles	7	1	23	22	6	4	2	0
butterflies	3	0	0	0	0	3	1	1
caterpillars	1	0	0	4	0	1	0	0
centipede	0	0	0	0	1	0	0	0
crickets	0	0	0	1	0	0	25	0
Flies	0	0	0	0	10	16	25	9
Gnats	3	0	0	0	0	0	0	0
grasshoppers	6	1	0	0	1	3	1	0
lacewing	0	0	4	0	0	0	0	0
leafhoppers	1	14	8	0	0	35	56	0
millipedes	0	0	0	0	0	0	0	0
Mill worms	0	0	0	0	0	0	0	0
mosquitoes	1	0	0	0	0	0	24	0
Moths	0	0	0	0	0	0	0	1
pill bugs	0	0	0	0	0	1	0	0
Spiders	1	1	1	1	6	42	73	0
Ticks	0	0	0	0	0	0	0	0
unknown								
winged insect	1	2	0	7	2	3	0	0
unknown								
worms	0	0	0	0	25	0	0	0
Wasps	0	0	0	0	0	2	3	0
Weevils	0	0	2	0	0	0	1	0

Table 2 (cont.)

Group	Soil				Quadrat			
	1	2	3	4	1	2	3	4
Ants	0	1	0	1	2	0	0	0
Bees	0	0	0	0	0	0	0	1
Beetles	1	1	0	3	0	3	3	3
butterflies	0	0	0	0	0	0	0	0
caterpillars	0	0	0	0	0	0	0	0
centipedes	0	0	0	0	0	0	0	0
crickets	0	0	0	0	1	0	0	0
Flies	0	0	0	1	0	0	4	0
Gnats	0	0	0	0	0	0	0	0
grasshoppers	0	0	0	0	0	0	0	0
lacewing	0	0	0	0	0	0	3	1
leafhoppers	0	0	0	0	0	0	0	0
millipedes	0	0	0	0	2	0	0	0
mill worms	0	2	0	0	0	0	0	0
mosquitoes	0	0	0	0	0	0	0	0
Moths	0	0	0	0	0	0	0	0
pill bugs	0	0	0	0	0	0	0	0
Spiders	0	0	0	0	1	0	8	0
Ticks	0	0	0	0	1	0	0	0
unknown								
winged insect	0	0	0	0	0	0	0	0
unknown								
worms	0	0	1	1	0	0	0	0
Wasps	0	0	0	0	0	0	0	0
Weevils	0	0	0	0	0	0	0	0

*Data Analysis:* Once the nesting season is complete, statistical analysis will be conducted to determine nesting preference on the basis of nesting box type, insect and invertebrate populations and vegetation. In addition to the data collected by the students, meteorological data for the time period will be included in the analysis.



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