Bluebird Box Proposal

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Abstract

There are roughly 10,000 bird species located around the world and 0.03 percent of species belong to the *Sialia* family, or more commonly known as the Eastern Bluebird. In Paulding County, Georgia, the most common Bluebird is the Eastern Bluebird species, *Sialia sialis*. According to National Geographic (2018), they "are primarily found east of the Rockies, and range from Canada to Mexico and Honduras" and they are known for their vibrant blue and black wings.

In the early 20th century the eastern Bluebird population experienced a decline due to habitat loss, invasive species, and environmental factors. With an increase in the demand to modernize, deforestation has become a prevalent cause of habitat loss for the Bluebirds. Landowners have increased the amount of land being cleared for urban development and this has led to a decrease in the availability of adequate nesting areas — dead trees — for the Bluebirds to inhabit.

The bird species *Passer domesticus* (House Sparrow) was first introduced to the United States around 1800. The House Sparrow and eastern Bluebird "are common cavity-nesting birds that can compete with each other for nest sites in habitats where they overlap" (Neal & Rolland 2015). In response to the decrease in habitat, the invasive species, House Sparrow, are increasing their seizures of Bluebird nests by puncturing eggs and/or killing both the nestlings and parents (American Bird Conservatory, 2018).

Additionally, a prominent environmental factor that is affecting the Bluebirds is drought. A lack of precipitation reduces the amount of vegetation and habits available to birds and their nestlings. This has negatively affected the Bluebirds that rely on those depleted resources for

survival and reproduction. A study that measured the success of the eastern Bluebird with the severity of drought concluded that "hatching and fledging rates decreased as drought severity increased" (Carleton, Graham, Lee, Taylor, & Carleton, 2019).

In recent months, country-wide efforts have gone toward the restoration of the Bluebird species. Hand-made bird boxes are being constructed and put up around the United States to ensure proper monitoring and protection of the Bluebirds. The restoration practices have not only aided in increasing the Bluebird population but they have also promoted research of the species. Prior to the bird boxes, Bluebirds weren't thoroughly researched; they were only known to protect crops from insects. By monitoring these boxes, researchers have found and able to remove some of the House Sparrow populations that were taking over Bluebird boxes. Additionally, they discovered the proper living conditions to ensure good health in the Bluebirds. This data has aided in documenting patterns of Bluebirds and their fluctuations in the population.

Bluebird Box Research

At Paulding County High School, we have monitored Bluebird boxes over the past three years. With bird box research, the nesting season begins around February and ends around mid-March. Bird boxes need to be set up prior to February. Their placement is dependent on distance between other boxes, orientation of the entrance hole, and distance from the tree line. The Bluebird research includes checking the boxes approximately every week during the nesting season to see if a bird has inhabited it. The students observe the nesting material and egg characteristics; afterwards, the students determine what species of bird is nesting in the box using these observations (Smithsonian Environmental Research Center, 2016).

During our Bluebird research, we have discovered that while we have useful data to build upon, we do not have enough data to determine statistical significance. With more data from your school and other schools, we will be able to perform chi-square tests to see the statistical significance of the chosen variables to determine what helps Bluebirds the most. Our data shows some significance in the direction of the box and most data showed that bird boxes farther away from the treeline had more Bluebirds.

Bluebird Box Data

Year	# of nested boxes	# of Bluebirds	# of chickadees	# of Carolina Wren	# of House Sparrows
2017	12	2	5	2	3
2018	12	3	4	1	4
2019	12	4	2	2	4

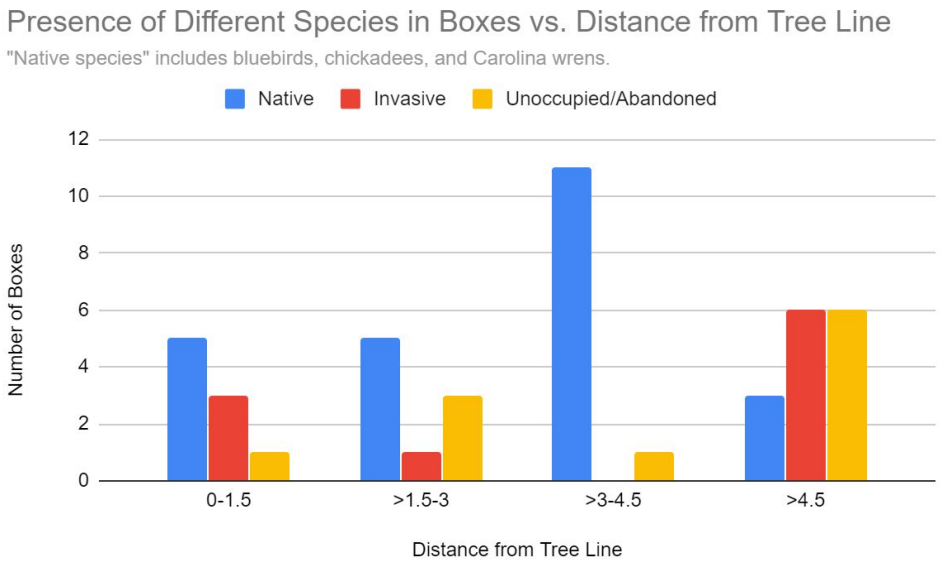
*This data shows the number of birds that nested each year.

After observing our data, we investigated the relationship between the type of bird species and the distance the nest is from the tree line to see significance.

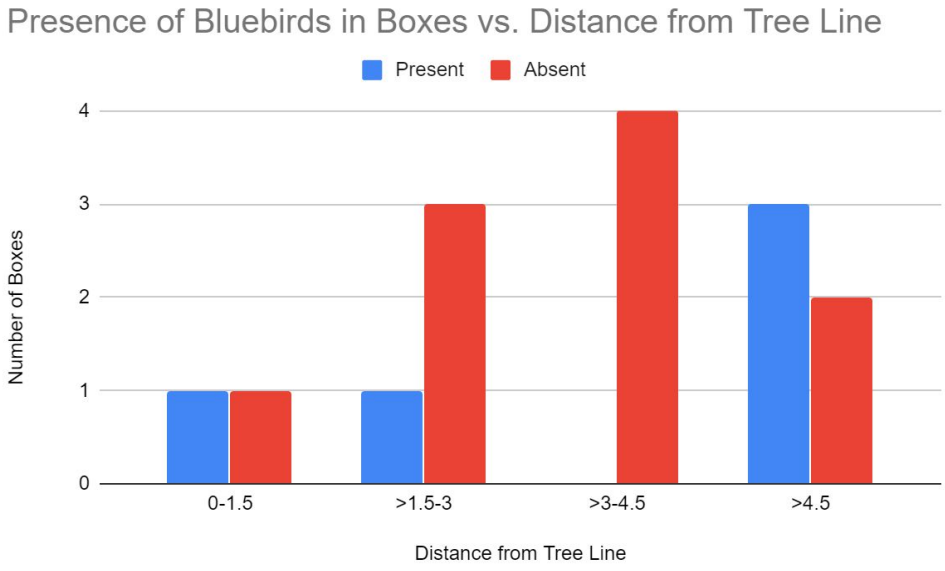
Two-Way Table of Presence of Invasive Species vs. Distance from Treeline

	Distance from Treeline (m)				
	0-1.5	>1.5-3	>3-4.5	>4.5	**Total**
Yes	1	1	0	3	5
No	1	3	4	2	10
Total	2	4	4	5	**15**

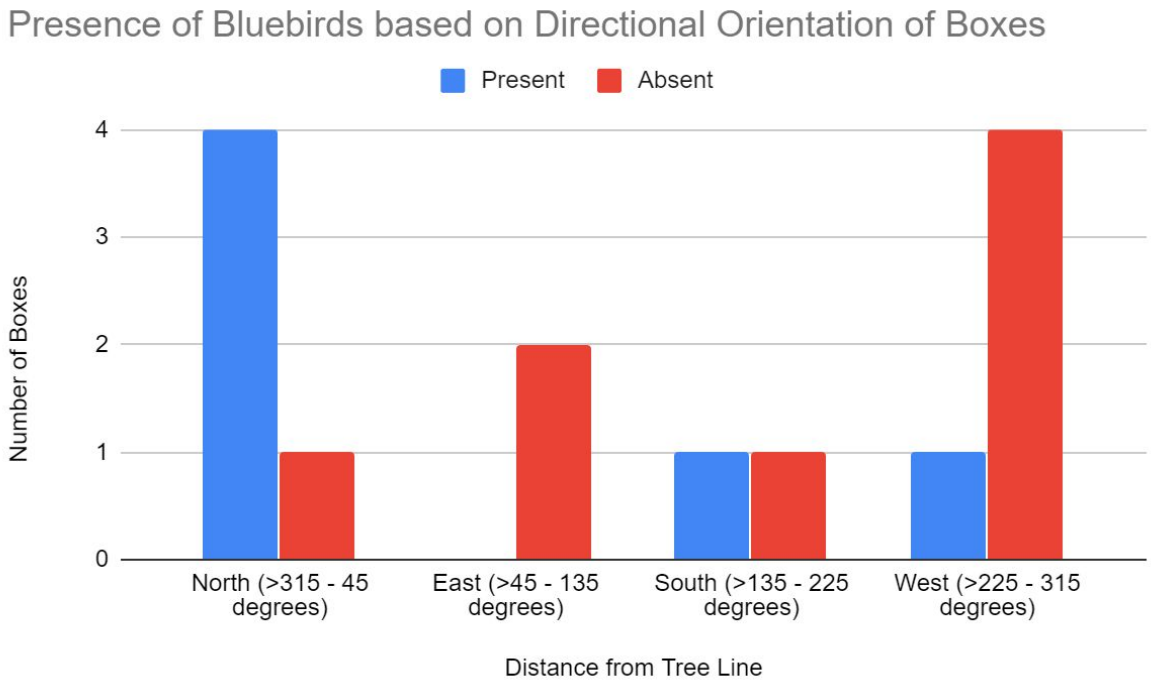
*The chart above displays whether the bird boxes from the different distances were occupied by the invasive species or not.



*Based off of our "Presence of Different Species in Boxes vs. Distance from Tree Line" graph, we can infer that native species from this sample prefer bird boxes boxes that are between 0-4.5 meters from the tree line while invasive species prefer bird boxes that are greater than 4.5 meters from the tree line.



*Based off of our “Presence of Bluebirds vs Distance from Tree Line” graph, we can infer that Bluebirds from this sample prefer bird boxes that are greater than 4.5 meters from the tree line.



*Based off of our “Presence of Bluebirds based on Directional Orientation of Boxes” graph, we can infer that Bluebirds from this sample prefer bird boxes boxes oriented in the northern direction.

Future Research

Plan: We would like to collect more data so that we can conduct a Chi-Square test for association. Association is the way of determining if two things have an impact on one another. In order for the chi-squared test to be conducted we need to meet the following conditions:

Random- Because the amount of possible bird box locations is virtually infinite, then the locations of bird boxes on campus can be considered random.

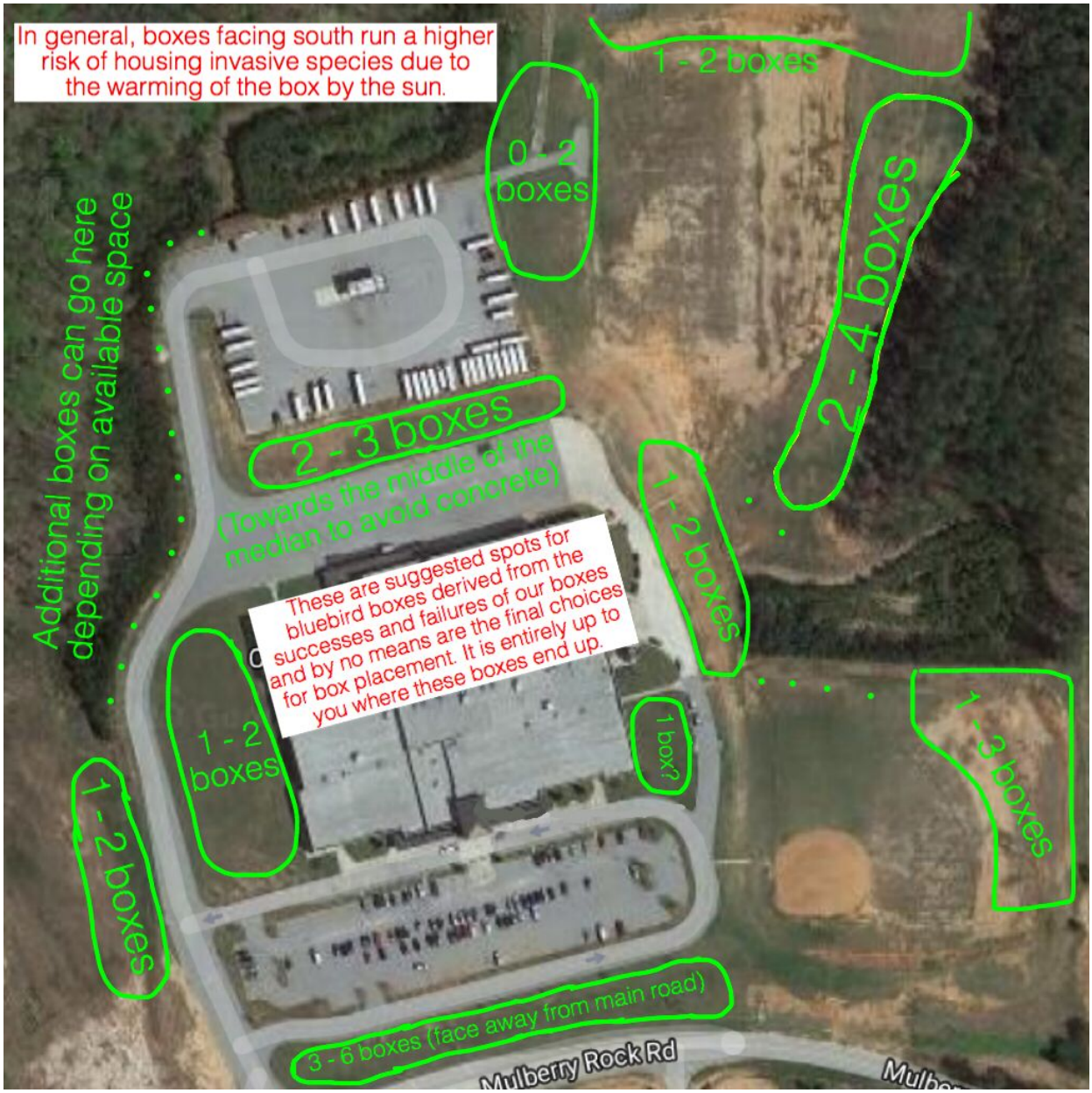
Independent- Individual bird box locations are independent of one another and observations of each bird box would be independent as well.

Large sample size- Because the number of bird boxes is 15, expected counts are not likely to be greater than five. There would need to be at least 20 bird boxes to take data from at the minimum, but greater than 25 would be ideal.

Scoggins Middle School has been chosen to participate in the expansion of our bird box research mainly because Scoggins is a feeder school into Paulding County High School. Students will be able to continue their research with the bird boxes in high school and learn how to effectively use that data to continue the growth of the bird box project at more schools and locations across the county. Additionally, Scoggins has a lot of open land with trees away from the main campus, which will give a contrast to the area around Paulding County High and allow us to compare how the different characteristics around the boxes affect nesting rates.

For the bird boxes themselves, we are going to help in the set up of the bird boxes, such as building them and helping the students determine the placement of the bird boxes (refer to the map below). We will explain to the students how to collect data on the bird boxes, then the students can collect the data on their own. We will use their data to determine the restoration efficiency of their and our project as a whole. We will ask for the data after three years to carry the project at the start and finish of the individual middle school's career.

Map of Scoggins Middle School for Box Placement



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