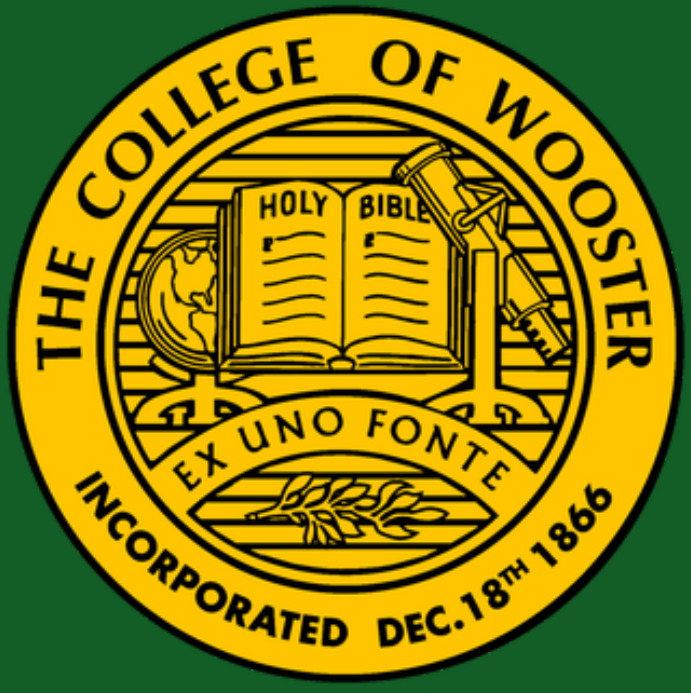


Sky-Blue Princess: An Analysis of Cerulean Warblers and Whole Songbird Communities through Passive Acoustic Monitoring at Fern Valley Field Station



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Background

Forest regeneration is important for conserving biodiversity in an ecosystem, and for sequestering carbon along with cooling the immediate climate. One bioindicator that is particularly useful for measuring ecosystem health are songbirds.



Figure 1: Fern Valley Field Station

Songbirds in regenerating forests have been widely studied, but no studies have been completed in Ohio or nearby states.



Figure 2: Cerulean Warbler (from The National Audubon Society)

This study's focus was on number of detections for the whole bird community in both the mature and regenerating forest.

What makes Fern Valley an important ecosystem is not only the regenerating environment, but a pocket population of Cerulean Warblers (*Setophaga cerulea*), which are currently declining in numbers and are of conservation concern.

Methods

Six Wildlife Acoustics Mini Song Meter recorders were deployed at Fern Valley on May 29th, 2025, with three in the mature forest, and three in the regenerating forest. They were left in the field for 32 days, recording three times per day: one ten-minute period at sunrise, and two more ten-minute periods one hour, and two hours after sunrise. The recorders were collected on July 2nd, 2025.

All calls were analyzed and sorted by species using Kaleidoscope Pro. Some species identifications were made using BirdNet or by comparing calls to recordings from the Macaulay Library.

Over 96,000 calls from 31 species were identifiable and used as part of the final data. Data were analyzed in SPSS using Chi-Squared Goodness of Fit tests.

Total Number of Observations per Species by Habitat

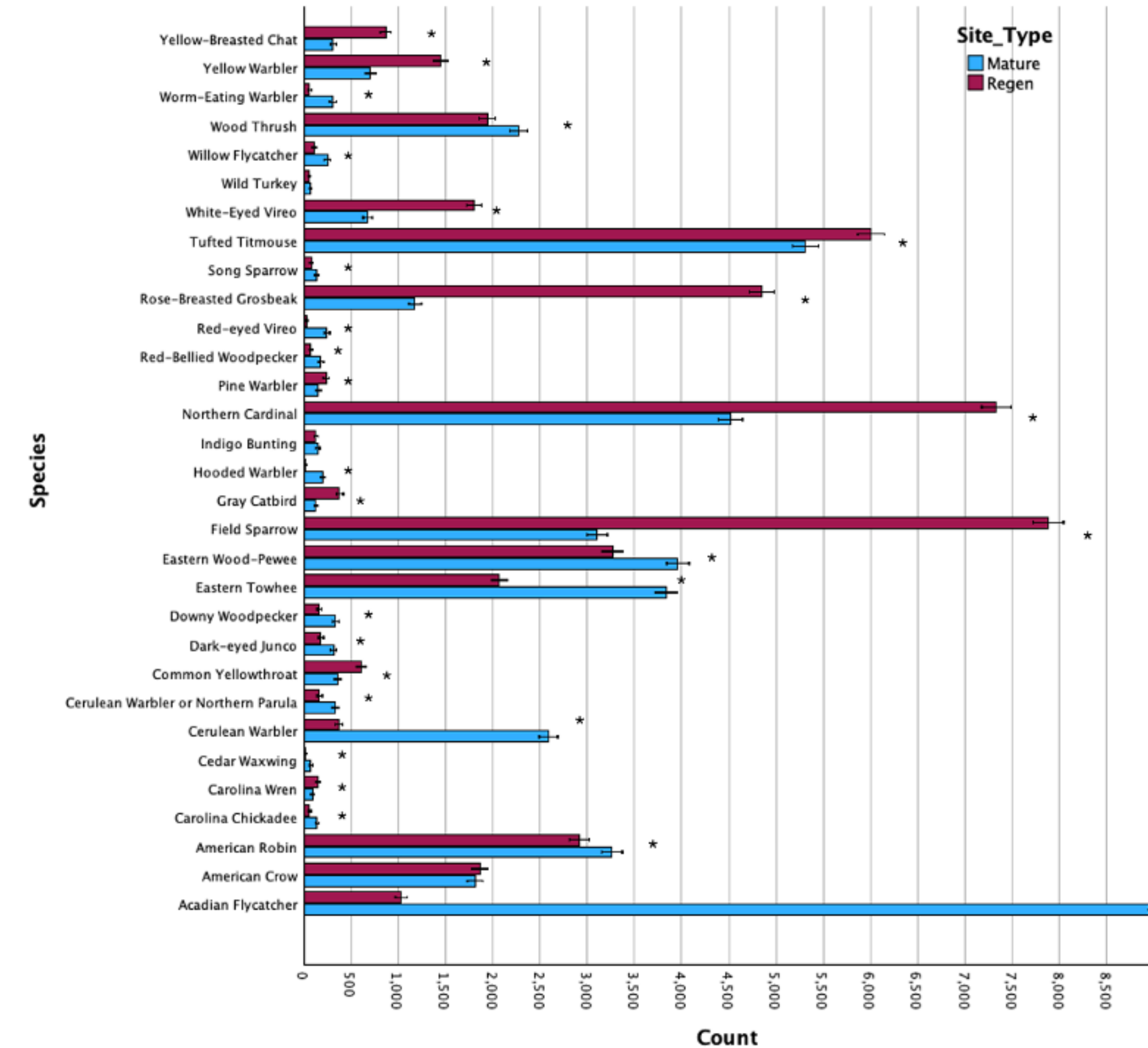


Figure 3: Bar chart displaying the numbers of each species observed by habitat type. Asterisks signify a significant difference (<0.001) in bird counts between the mature (blue), and regenerating (red) forests. All significant findings resulted in a P value of <0.001 . Error bars signify a 95% Confidence Interval. The mature forest Acadian Flycatcher count has been cut off for clarity of other less-observed species. The total number of Acadian Flycatchers observed in the mature forest was 13320.

Cerulean Warbler Count by Site Observed Versus Expected

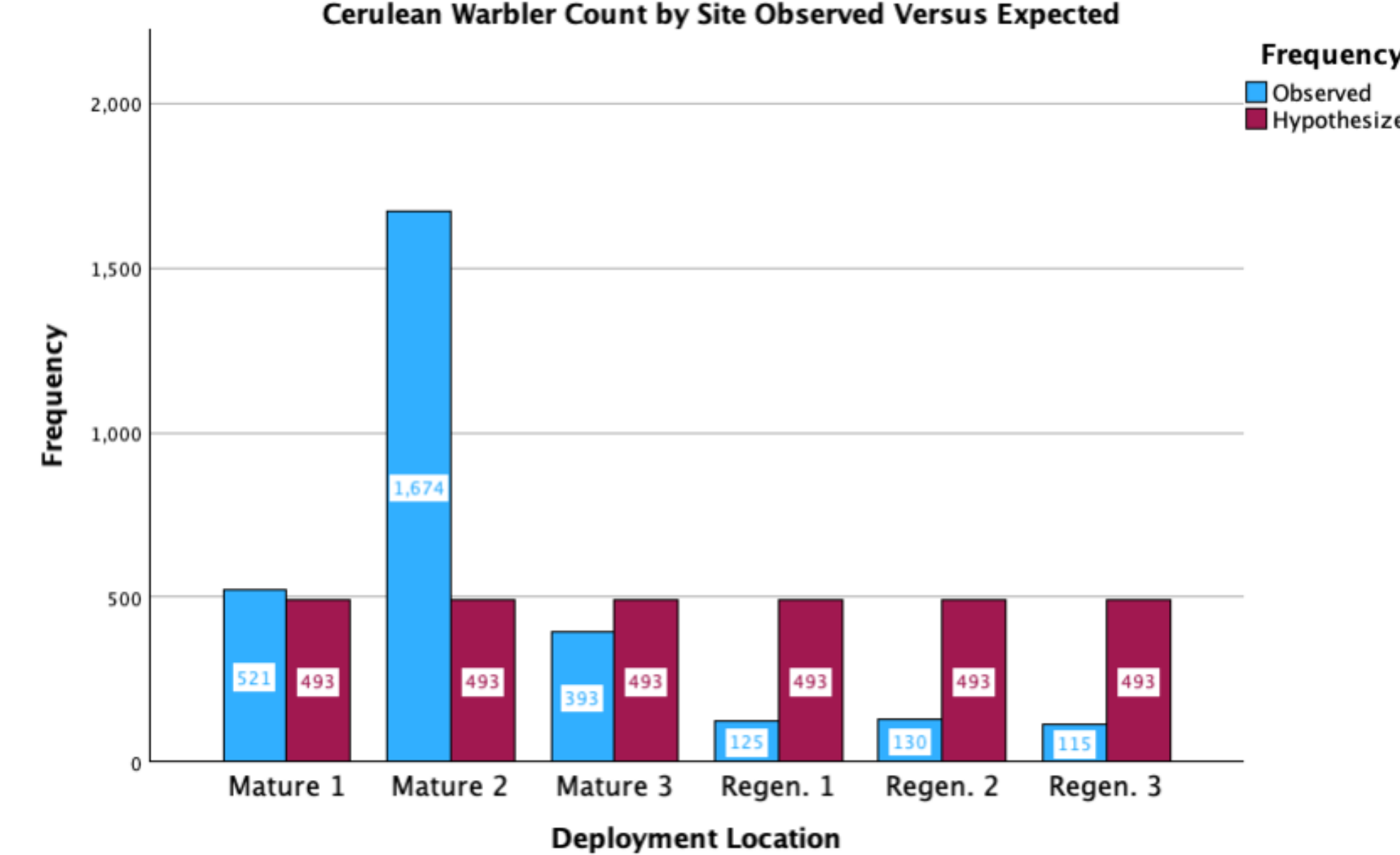


Figure 4: Number of Cerulean Warbler calls by deployment location. "Regen." is an abbreviation for "Regenerating", shortened for clarity. Observed values are depicted in blue, and expected values are denoted in red. These observed and expected values were calculated into the Chi-Square test for Cerulean Warblers by deployment location.

Results and Discussion

It was observed that the whole-bird communities differ between mature and regenerating forests, as predicted. Both habitats contained a combination of habitat generalists along with habitat specialists. Some of these specialists are forest, field, or edge specialists.

Cerulean Warblers, as hypothesized, were detected more often in the regenerating forest, specifically at Mature location 2.

While most of the results were not surprising, there were three instances of unusual presence and a potential hybridization event between the Cerulean Warbler and Northern Parula (*Setophaga americana*). Since the evidence for a potential hybrid is based on calls, visual sightings are needed to confirm presence. As for the other three unusual findings, Tufted Titmice (*Baeolophus bicolor*) were detected more often in the regenerating forest when they are normally forest specialists. Worm-eating Warblers (*Helmitheros vermivorum*) were also detected, yet their range does not reach Holmes County. Finally, Dark-eyed Juncos (*Junco hyemalis*) were detected throughout the breeding season, when they normally depart Ohio in the spring.

This study proves that not only could some birds be changing their breeding habits, but that the Midwest holds biodiversity that should be valued. Additionally, the results of this study can provide a baseline not only for Fern Valley, but as a guide for what to expect during regeneration efforts. Finally, Fern Valley is a valuable site with potentially unusual breeding bird activity, and should be protected and studied.

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