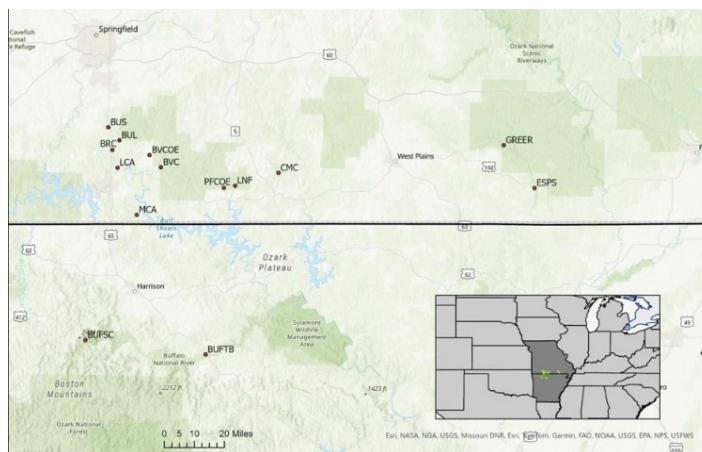


Giant cane (*Arundinaria gigantea*) and the Swainson's warbler (*Limnothlypis swainsonii*): Implementing innovative monitoring techniques for species of conservation concern

Gabriela Carroll

Giant river cane (*Arundinaria gigantea*) once formed vast canebrakes across the southeastern United States but has been reduced to about 2% of its original range, making it a critically endangered ecosystem. Canebrakes once provided resources and habitat for nearly 70 animal species. Among those species is the Swainson's Warbler (*Limnothlypis swainsonii*), hereafter referred to as SWWA, one of the rarest migratory songbirds in North America. In Missouri, this bird species is currently listed as endangered, and we know little about its actual range within the state. This is likely because the species is rare and secretive.

We know of a few existing canebrakes in the Ozarks that could provide habitat for the SWWA, so we set out to discover if they were being occupied by the species. With funding from the Missouri Birding Society and Missouri State University, we obtained 29 Autonomous Recording Units (ARUs) and distributed them throughout 13 different canebrakes in the Ozarks and 1 within Mark Twain National Forest during the 2024 breeding season (Figure 1). This latter site (Greer Crossing Recreation Area) was used to gather recordings from SWWA after visually confirming their presence.



decisions on what species a certain vocalization belongs to. We input our recordings into BirdNET, and the algorithm made predictions about which species each vocalization belonged to much faster than a human listener could have.

We found that every single one of our sites had many SWWA predictions. However, we quickly realized that some species were particularly confusing for the algorithm. The Indigo Bunting, White-Eyed Vireo, and Louisiana Waterthrush (LOWA) had songs which contained characteristics similar enough to the SWWA song, so that BirdNET repeatedly misidentified them as SWWA vocalizations.

One of the drawbacks of BirdNET is that the recordings with which it is trained tend to be high-quality and made in low-noise conditions. Since our recordings were made with lower-quality microphones in noisy environments (most of our sites were right next to streams), the mismatch with the training data may have increased our rate of false positives. We decided to train a custom classifier using the same algorithm but with a subset of our own recordings from the field.

We included Indigo Bunting, White-Eyed Vireo, and LOWA recordings from various canabrakes in our new training dataset. We also included SWWA recordings from Greer, since we knew those represented true positives. Our goal was to fine-tune the algorithm so it could better distinguish between these problematic species and true SWWA songs.

We found that truncated versions of the LOWA song are more than confusing for the algorithm, being almost indistinguishable from the songs of the SWWA. We realized that we needed to take a step back and figure out how to differentiate one species from the other in a consistent way. To do this, we used 30 songs of each species from the Macaulay Library and obtained acoustic measurements from each song's notes. Despite running multiple statistical tests, we were unable to find notable and consistent differences between the songs.

While without further analysis we could not find ways to clearly differentiate between their songs, we did find that the SWWA has one version of its territorial song that is very common in our Greer recordings (Figure 2), the Macaulay Library, and Xeno Canto.

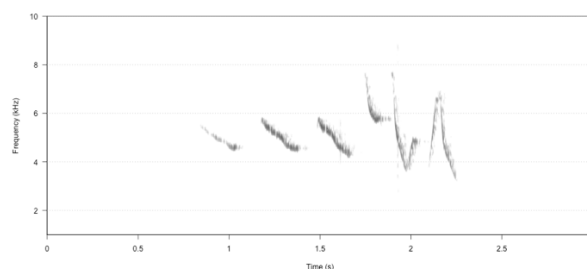


Figure 2. SWWA ARU recording from Greer. Note the “number 4” note (second to last, shaped like the number 4) followed by the “weww” (last note, sharp overslur).

We found that SWWA are present at one of the canebrakes at Eleven Point State Park (Figure 3). Though their presence at this site is not surprising given the proximity to Mark Twain National Forest, we were able to use this site to show that our custom classifier works well at detecting SWWA when they are present. We had many predictions at other sites that we could not confirm or deny as true SWWA detections given their similarity to the song of the LOWA. To avoid false positives, we were very conservative in deciding which SWWA detections to confirm as “true”.

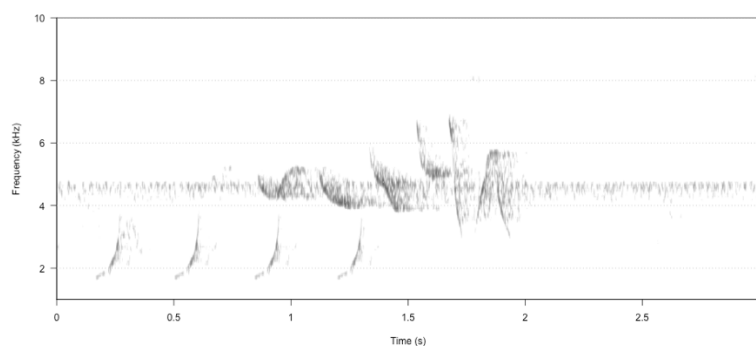


Figure 3. SWWA song recorded at Eleven Point State Park by ARU 1

The results of this study suggest that the SWWA is confined to a relatively small portion of Missouri, with the species inhabiting the areas around and within Mark Twain National Forest almost exclusively. It is possible either that the canebrakes located in the southwest part of the state are not large enough to attract the species or that there are other constraining factors for this species' range. Further research is needed to determine why this species' range is so limited in Missouri.

The funds awarded by the Missouri Birding Society were imperative in the completion of data collection for this project, as they were used to purchase several ARUs and aid in the expenses associated with travel. We extend our deepest gratitude to the Missouri Birding Society for their generous support of this study. The funded project formed part of a master's thesis at Missouri State University, carried out in Dr. Jay McEntee's lab with valuable support from MSU graduate and undergraduate students in the field.