

Identifying Important Habitat Features for Bat Conservation using Acoustic Sampling and GIS

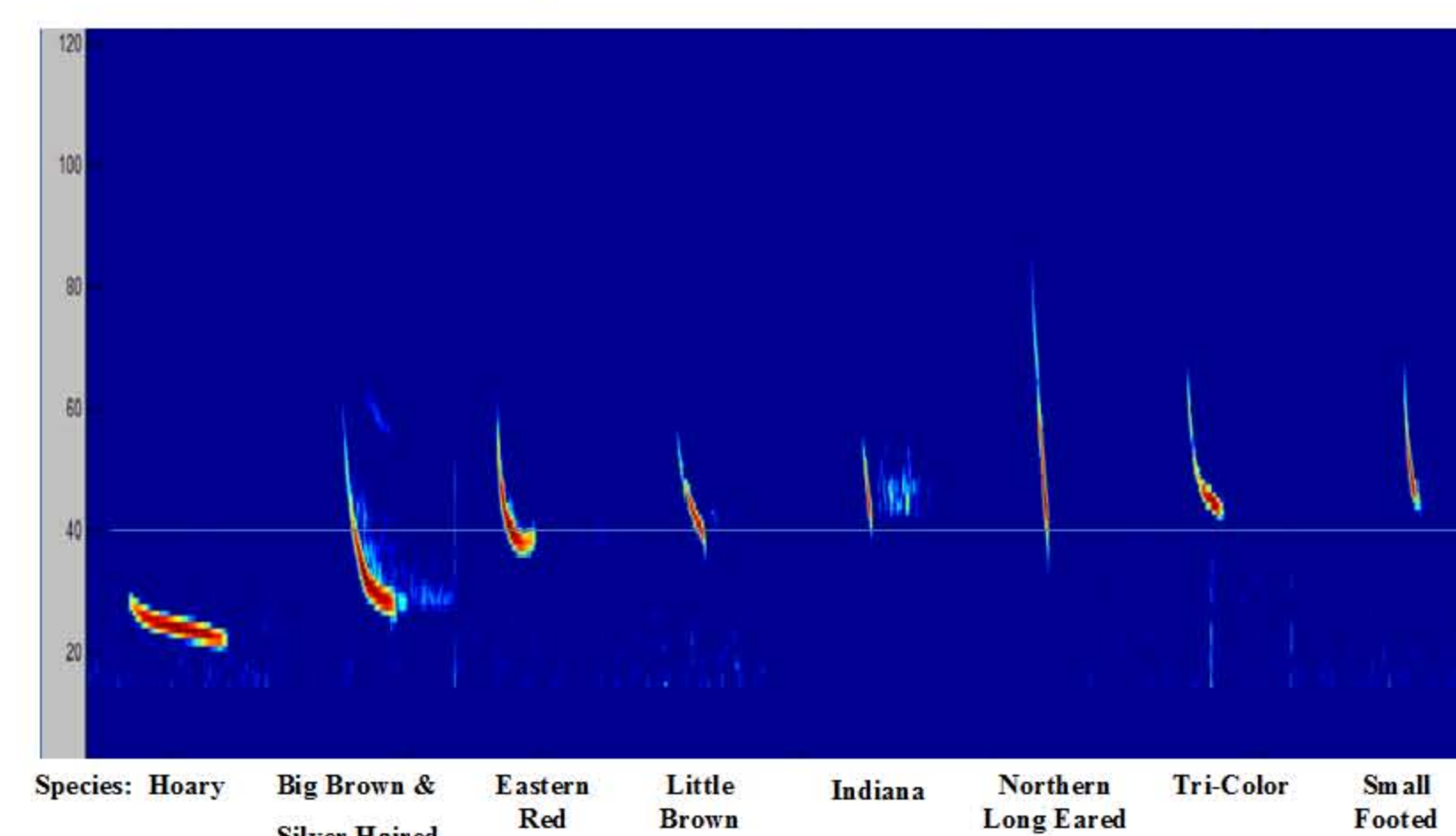
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Abstract:

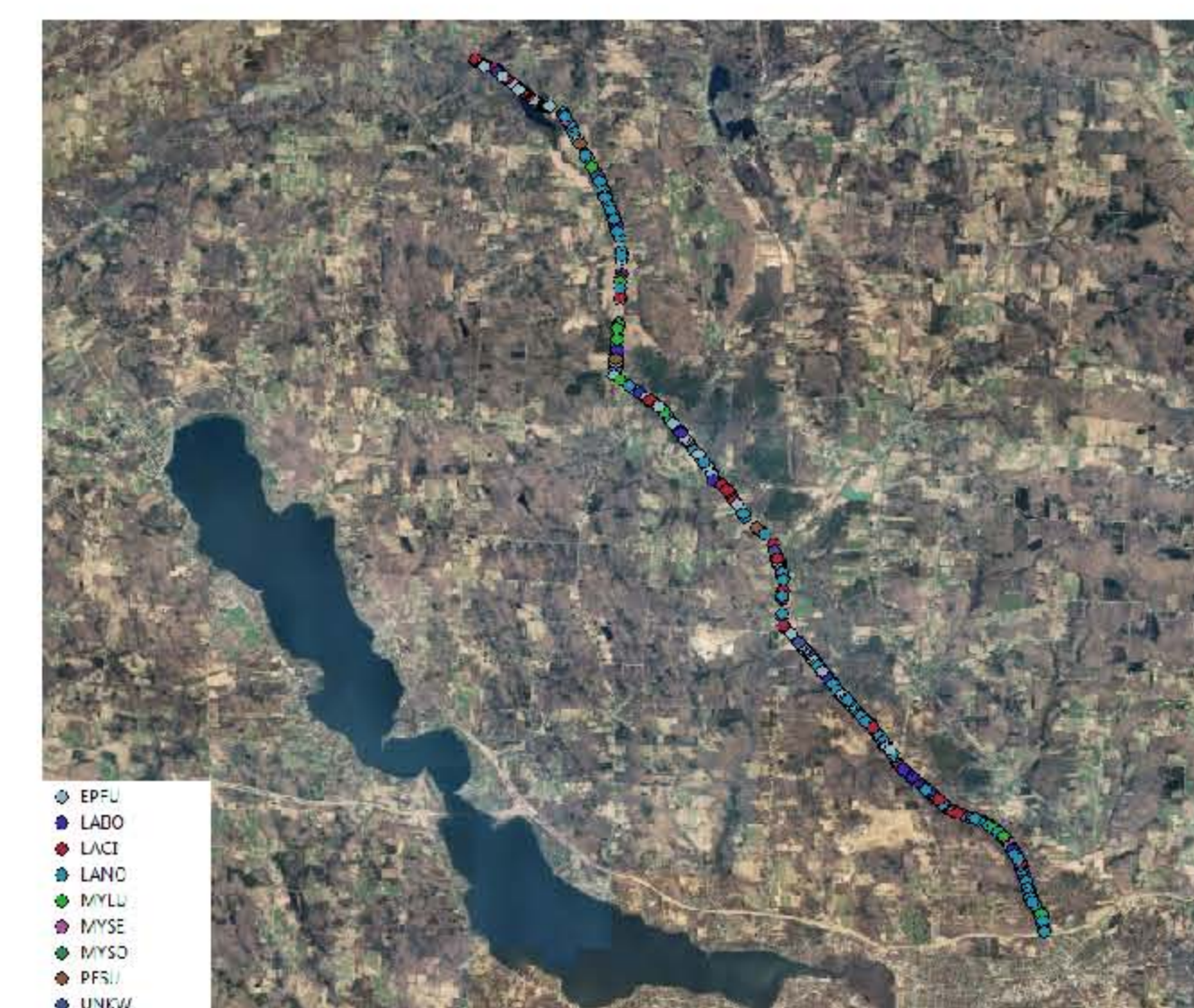
Bat populations worldwide have been under pressure for decades due to loss of habitat, roost disturbances and environmental toxins. Recently White Nosed Syndrome has been infecting bats in their hibernacula in the United States, and to date has killed almost 6 million bats. In order to improve bat conservation efforts, habitat delineations and subsequent bioacoustical sampling was conducted along two transects in Chautauqua County, NY, with the goal of identifying habitats and features that may be important to bat species.



Combined spectrogram illustrating "search phase" call characteristics for bat species found in New York State.

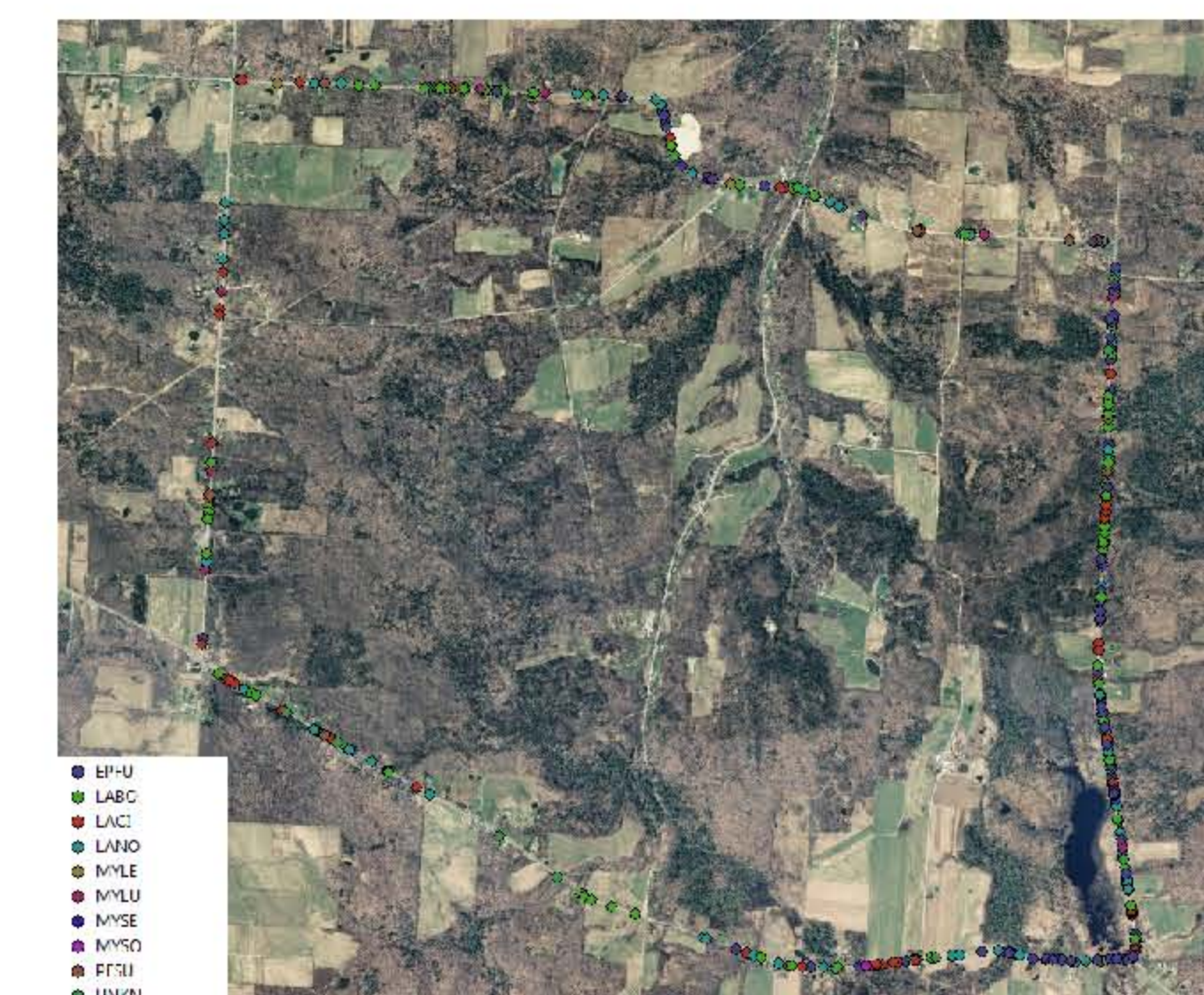


Jamestown Transect

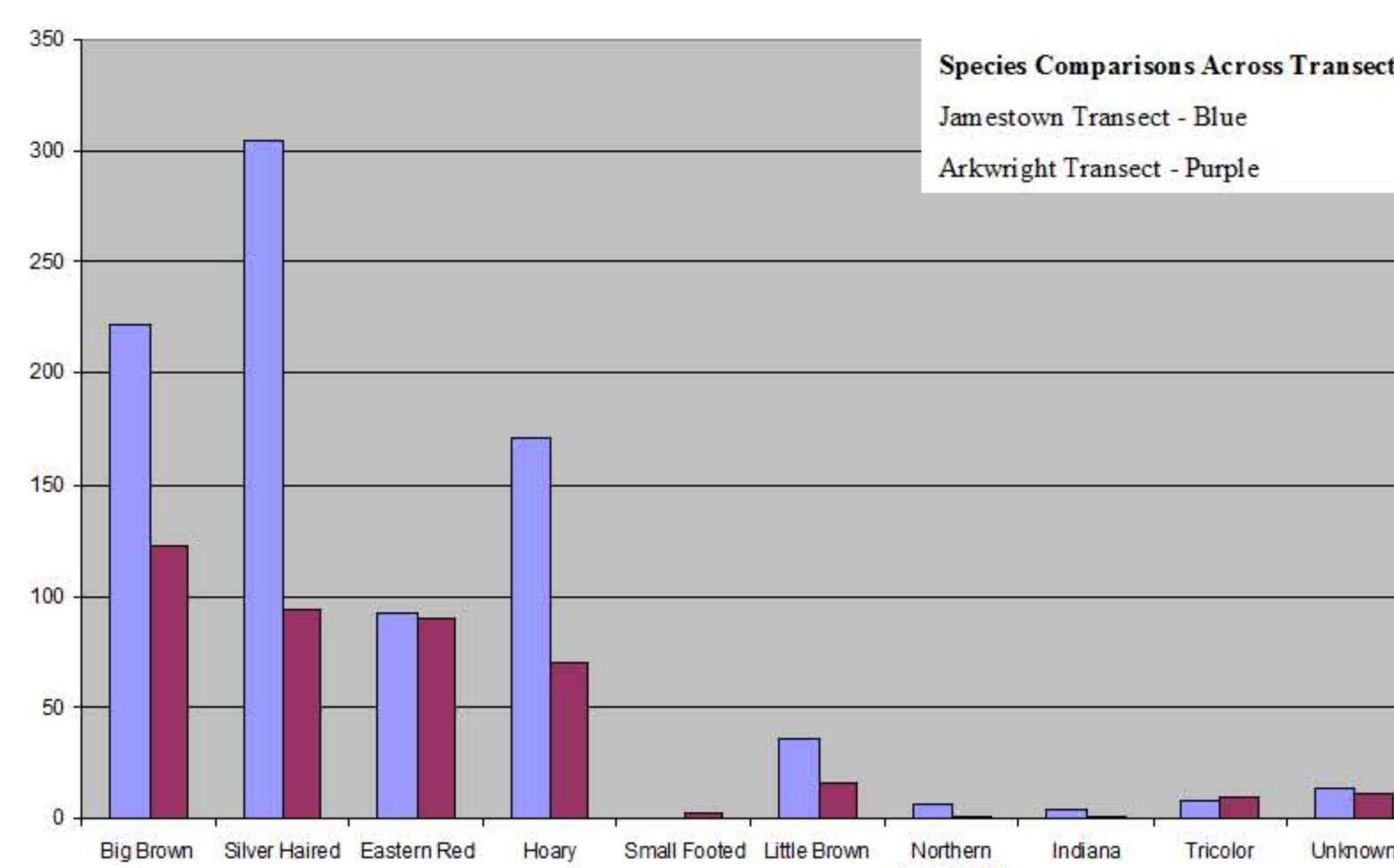


The Jamestown transect is 21 miles in length, and runs from Bear Lake to the outskirts of Falconer, NY following Rt. 380. The Arkwright transect is 11 miles in length and follows Rt 83, Zailm Rd, Straight Rd and Rt. 79. Both are located in Chautauqua County. Shown here are the transects, outlined by the bat species recorded during the acoustic surveys.

Arkwright Transect



Species distribution chart comparing bat diversity across transects



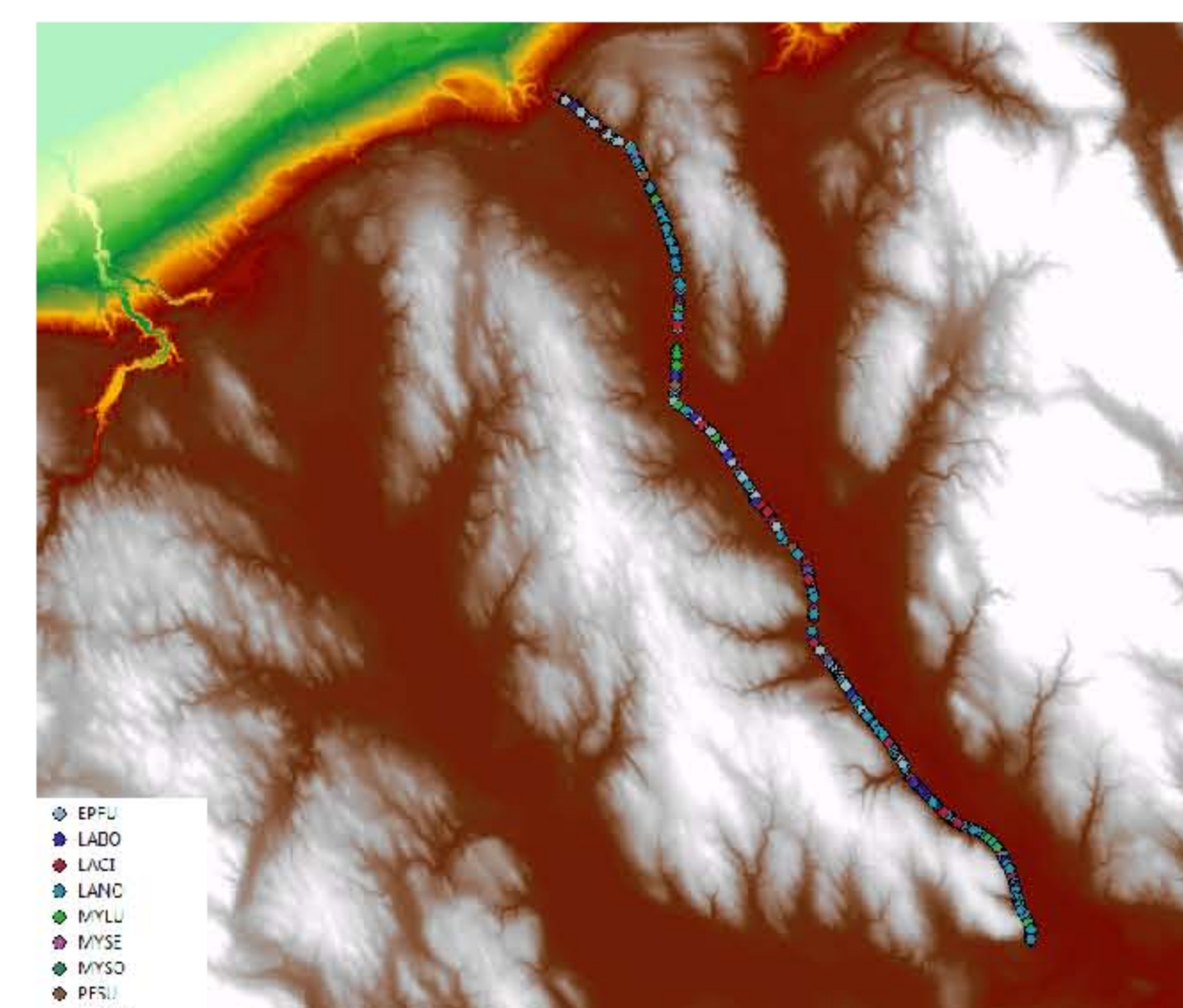
Significance:

- Little is known about bat habitat usage patterns
- Using mobile bioacoustic sampling as a data source for geo-spatial analysis in GIS is a novel approach
- Better understanding of critical habitat will result in more appropriate management practices

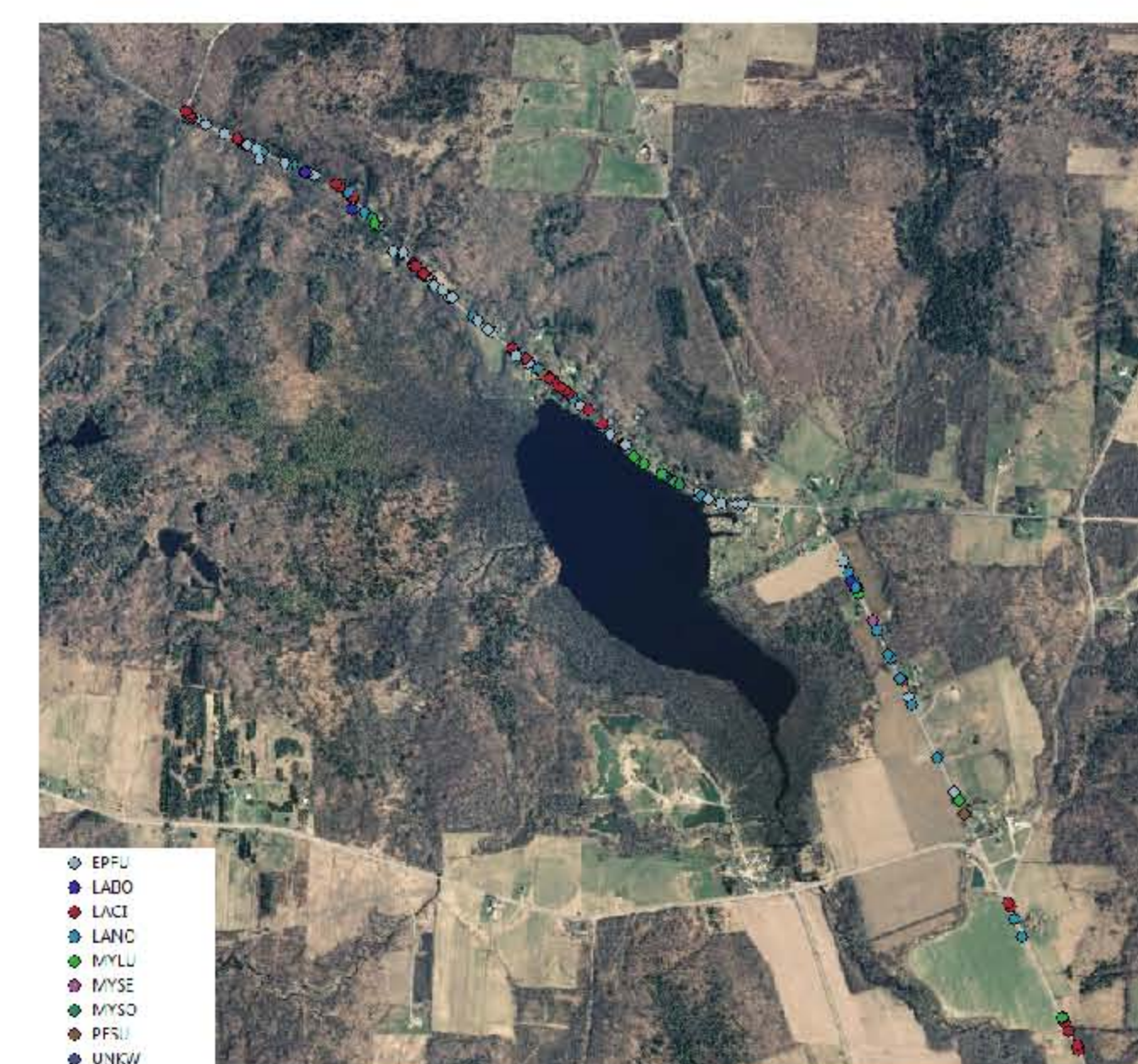
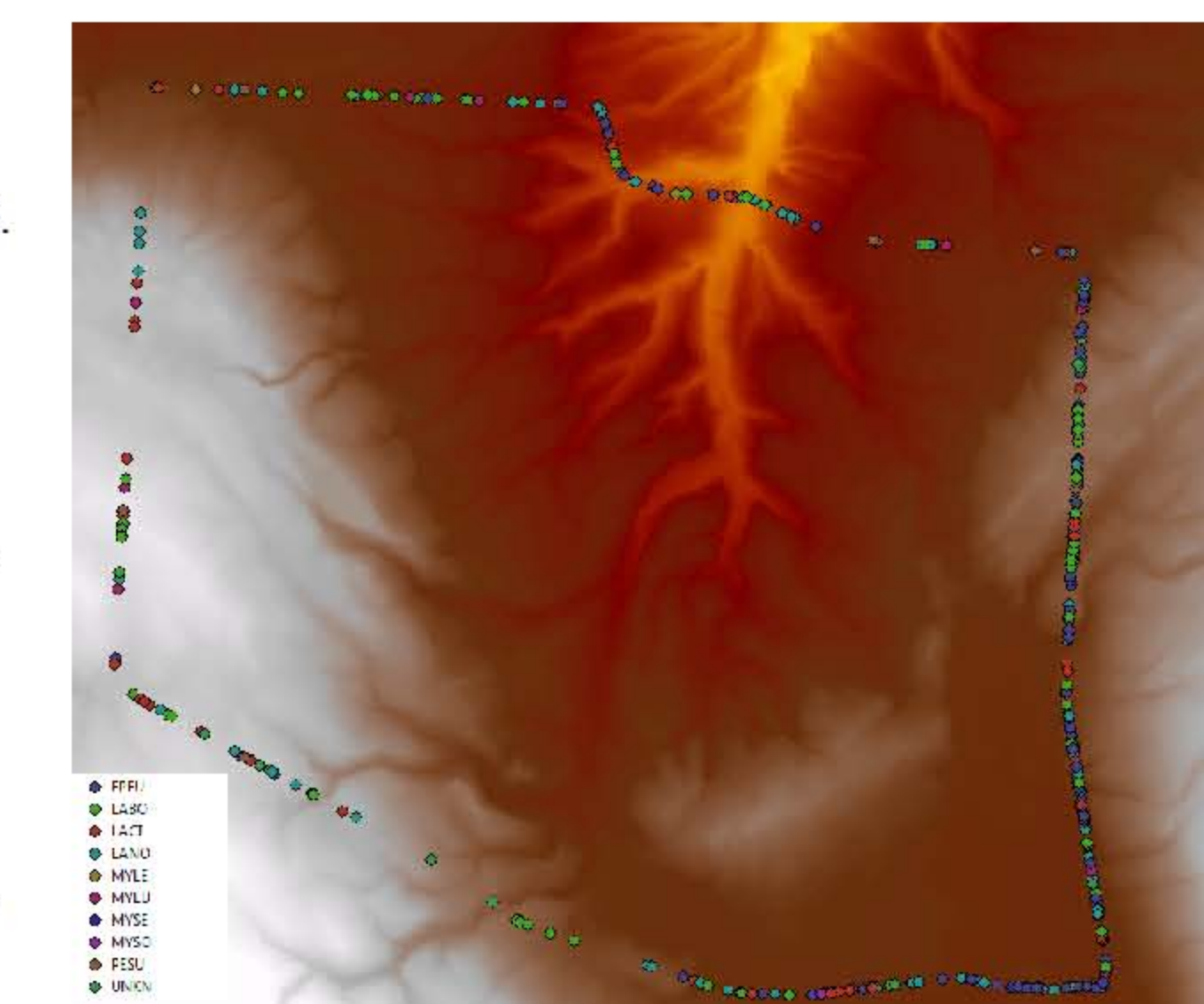


Methods:

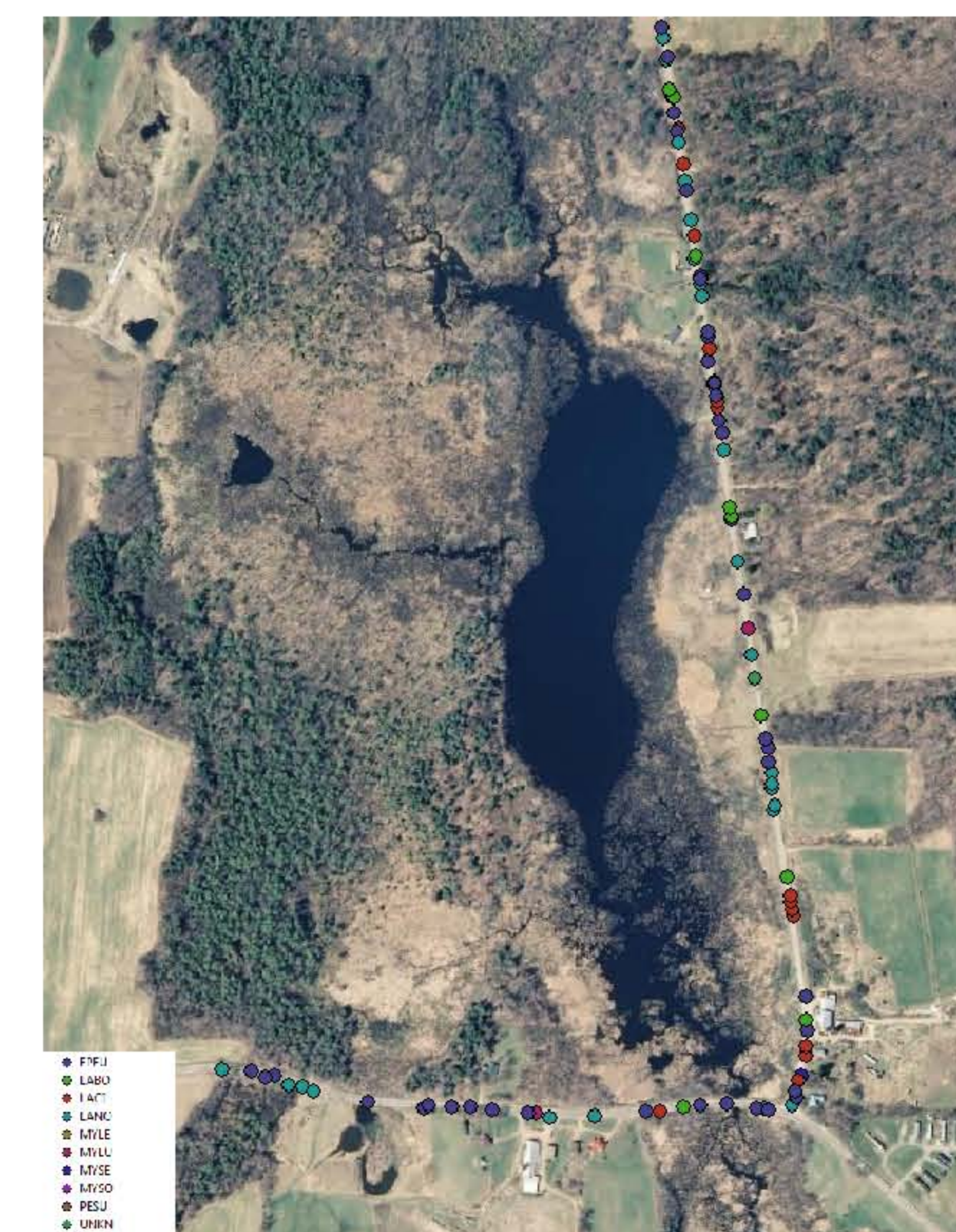
- Prior to acoustic sampling, habitat delineation was conducted along 32 linear miles (two separate transects) of roadway to be sampled during bat surveys. Six general habitat types were identified – forest, wetland, scrub, meadow, agricultural, and residential. Also included were waterways – lakes, streams, ponds etc.
- Bio-acoustic sampling was conducted using a vehicle mounted bat detector (Binary Acoustics Technology Model AR125). Atmospheric conditions were noted at the outset of each survey, which started 30 minutes after sunset. The vehicle was driven at a speed of 18-20 mph, in order to match bat's flying speed and ensure that each bat recorded was a separate individual. DeLorme's GPS unit and software were used to monitor the vehicle's speed and route, as well as collect geographic coordinates for later extraction.
- Bats were identified to species using a combination of software (discriminate function analysis) and manual identification processes.
- Geographic coordinates for each bat were paired from acoustic and GPS data using R, and were imported into ArcMap's GIS. This allowed for elevation data for each identified bat to be extracted. Further analysis into habitat usage patterns and proximity to local waterways is ongoing.



To the left and right are Digital Elevation Models (DEM), constructed using ArcMap's GIS. The average elevation for bat activity was 395.41m (Jamestown) and 432.51m (Arkwright). The Arkwright transect consisted of generally higher elevations, yet there were some similarities in elevation and bat activity. While the elevation data has not been statistically tested for significance, there does seem to be a correlation between activity levels and elevation.



The images to the left and right illustrate an anecdotal relationship between proximity to a water source and higher levels of bat activity. Additionally, activity levels were notably higher in forested regions – the combination of forest habitat and proximity to a water way saw the highest levels. Another potential relationship being examined is an apparent negative correlation between bat activity and agricultural fields/meadows.



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