

Sound Check: A Multi-Year Acoustic Recording Assessment of Avian Biodiversity in a Northeast Hemlock Forest vs. Wildfire Impacts, Meteorological Conditions and Geospatial Patterns

Force, Tycho (School: Westlake High School)

Numerous factors can affect avian biodiversity including air temperature, precipitation, wind, and air quality. This study aimed to determine how these meteorological and wildfire-related factors affect avian biodiversity. Four Acoustic Recording Units were set up in Hemlock stands in a lower Hudson Valley nature preserve, monitoring birds around dawn and collecting recordings of their calls. Birds were identified using Merlin Bird ID. Weekly data from the 2024 breeding season was compared to weekly data from the 2025 season to determine how meteorological and wildfire factors affect avian biodiversity. Overall, average weekly bird activity decreased by 16% while total species richness increased by 9%. Species richness is more accurate, though, as a species only had to be counted once to be part of the species richness value. Average precipitation decreased by 78.2%, air temperature increased by 5%, wind speed decreased by 25.8%, and air quality increased by 33.4%. The strongest negative correlation was between change in precipitation and species richness. Birds like the Song Sparrow and Wild Turkey had the greatest percent increases in population from 2024-2025 by 850% and 229%, respectively. The Carolina Wren and the Eastern Wood Pewee dropped in population the most, by 124 birds and 69 birds, respectively. Air temperature and wind speed surprisingly had a smaller effect on bird activity and species richness. There are multiple next steps to take, including studying the effect of these factors on bird phenology and song success and the training of AI used to identify individual birds.

Awards Won:

