

ExploreHope Camp: 'Angry Bird origins: Pollution effects on bird communities'

As of 2020, the world has lost an estimated two-thirds of its mammal, fish, bird, reptile, and insect populations. This extreme loss of biodiversity is widely considered a sixth mass extinction event. The rise of anthropogenic activities and their associated environmental pollutants are now considered a major contributor to these population declines. Recently, the National Science Foundation awarded a Building Research Capacity-Biology (BRC-Bio) grant to PIs Dr. Kelly Ronald (Biology, Hope College) and Dr. Natalia Gonzalez-Pech (Chemistry, Hope College) to explore the causes of biodiversity loss. In their funded project, PIs and undergraduate students will investigate the impact of pollution on an urban songbird model, the house sparrow (*Passer domesticus*), in order to explore this aspect of anthropogenic activity on avian behavior and physiology.



Figure 1. Perched house sparrow.

As part of this grant, we have developed a week-long summer research camp titled '*Angry bird origins: Pollution effects on bird communities*'. This camp will expose high school students to the different facets that anthropogenic pollution can take: both physical (i.e., air and water quality) and sensory (i.e., noise and light) and how this may be impacting avian communities. Each year of the project, 15 scholarships will be provided for traditionally underrepresented students to attend. ExploreHope will help to identify and recruit high-school students from their network of partnerships with regional schools including Holland Public Schools (HPS) and West Ottawa Public Schools (WOPS). These local districts have a 69% and 47% free and reduced lunch rate, respectively. Demographically HPS/WOPS are 45%/40% Hispanic/Latino students, 8%/3% African American students, and 4%/8% Asian/Pacific Islander students. To facilitate communication with student families, all recruitment materials will be provided in English and Spanish.

Undergraduate researchers will partner with ExploreHope undergraduate education majors to develop inquiry-based lesson modules that include both field and lab techniques. Camp participants will be divided into teams and will conduct an original sound propagation study to test how noise pollution and environment type can influence the propagation of sounds across different habitats. Participants will be trained in reading a scientific paper, forming a hypothesis and predictions, experimental design, and data analysis. Students will formulate a question based on their own interests and can easily alter the independent variable(s) (e.g., the sound that is played back, the propagation environment) or the dependent variables (e.g., frequency, amplitude, etc. of the recorded song) depending on their interests. Students will then go into the field to complete a playback study and bring the data back to the lab to do sound analysis with RavenPro and draw conclusions. At the end of the week, students will have the opportunity to make a poster and give a presentation in a conference-style presentation to outside members.

Best practice research indicates direct student engagement in forming questions and collecting data increases their self-efficacy to perform scientific tasks. Providing students with real-world applications in their school work also increases conceptual understanding for all students. Learning gains of participating high school students will be based on pre- and post-tests of outcomes from the Michigan Science Standards. Each camp in the program is aligned with 2-5 disciplinary core

ideas and at least one science and engineering practice. Using evaluation materials developed from the camp program along with newly evolving evaluation materials, participating students will receive pre- and post-tests to measure learning gains.

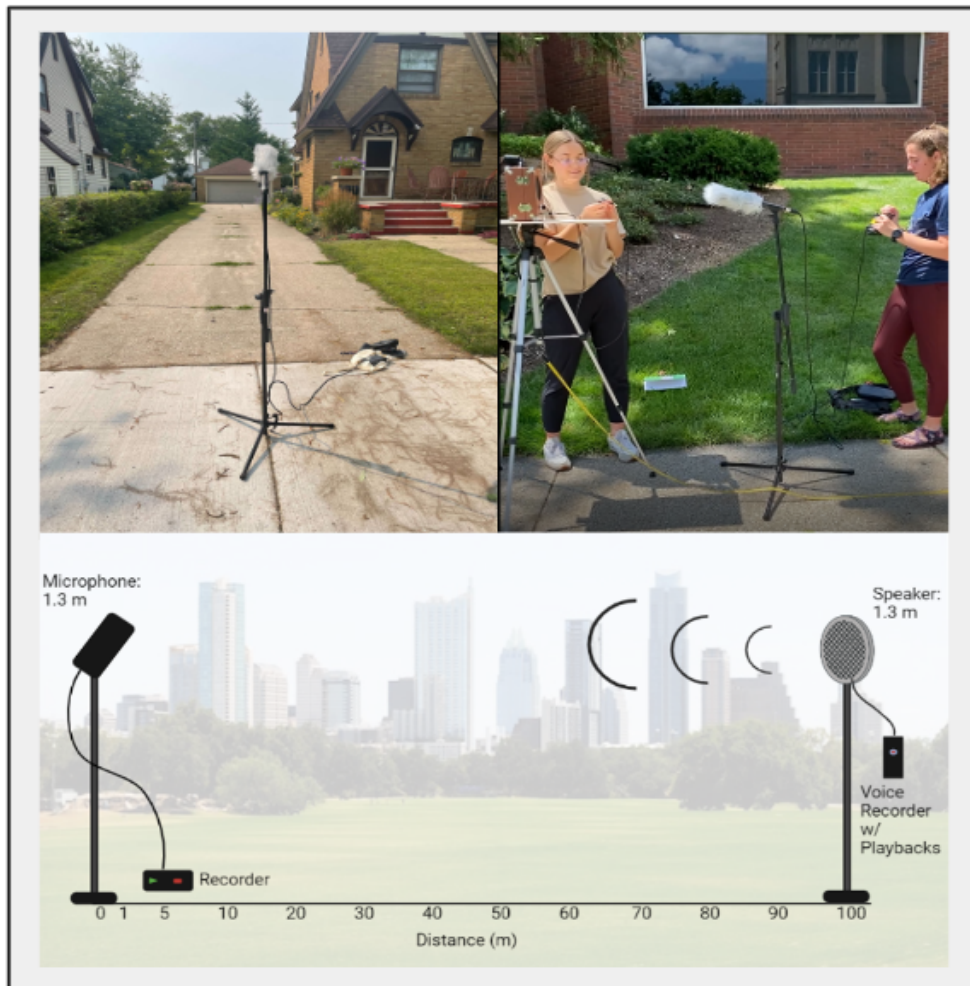


Figure 2. Undergraduate researchers conducting a propagation study. Schematic shows that a microphone is placed at different distances away from the speaker broadcasting the song.

SUPPORT

