

Study could help amphibian conservation efforts

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Credit: Virginia Commonwealth University

When a Southern chorus frog calls in the night from its wetland home, its voice sounds like a thumb being drawn across a fine toothed comb. At least that's how it's described by James Vonesh, Ph.D., associate

professor of biology. The sound of a spring peeper frog can sometimes be heard under that of its fellow amphibian. It has a quieter call; a succession of small beeps.

Undergraduate researchers in Vonesh's Amphibian Landscape Ecology class, through VCU Biology in the College of Humanities and Sciences, have worked to ensure that these and other [amphibian species](#) can continue to be heard on spring nights.

Students from the ecology class teamed with peer researchers at 11 other universities across the country in a semesterlong project, "Toads, Roads and Nodes," which investigated land use impacts on amphibians in the United States. This is the second year the class had undertaken the project, and it has produced further findings on the dangers of roadways to frogs.

Vonesh stressed that this and similar studies are essential to the protection of amphibians, the survival of which play a role in maintaining functioning ecosystems, on which people rely. Globally, there are more than 7,000 known amphibian species. Nearly one-third are extinct.

"Amphibians are both important prey and predators in food webs. They can be indicators of environmental degradation, like pollution, that may be of concern for human health," Vonesh said. "They have served and modeled systems across multiple fields of scientific research, and have been the source of natural chemicals with important medical properties."

The most recent cadre of researchers investigated how close roads across the Eastern and Central U.S. must be to wetlands and forested areas to affect multiple species of frogs. Researchers found the impact of roads on amphibians varies widely across regions, even among those with similar frog species. Both investigations have been published in peer-

reviewed journals—the latest project was featured in *Diversity and Distributions* this year.

The paper provided three undergraduates—Miranda Foster, Joseph Neale and Nate Stearret—the opportunity to be published in peer reviewed scientific literature. The students were mentored by Ph.D. student Julie Charbonnier.

The initial study, conducted in 2013, is one of the first distributed undergraduate research projects in the country.

David Marsh, Ph.D., a professor of biology at Washington & Lee University, developed the projects, funded by the National Science Foundation's Transforming Undergraduate Education in Science program and the National Center for Ecological Analysis and Synthesis.

Vonesh said the findings have the potential to be used by ecologists to facilitate amphibian conservation.

"Not surprisingly, perhaps, we see that the effects of nearby large roads might be the most important to focus on. But there are management options available to us to address this if society chooses to," Vonesh said. "For example, corridors or tunnels for small animals under roads might address this kind of road effect."

In order to form observations, researchers merged information from databases detailing geography, such as the U.S. Fish and Wildlife Service's National Wetlands inventory, with data from call surveys conducted by citizen scientists across the Eastern United States for the North American Amphibian Monitoring Program. The students were able to quantify what percentage of land surrounding NAAMP survey sites was devoted to agriculture, wetland, forest, agriculture and development.

Students found roads are sometimes huge barriers between two distinct types of land areas that frogs need to survive.

"We tend to think about [amphibians] being around aquatic habitats, but they use those habitats to breed and often use the upland habitats for the rest of their lives. Roads and barriers between these two spaces can stop them from completing their life cycle," Vonesh said.

Researchers also found the closeness of roadways to amphibian habitats in the Northeast had a more negative impact on amphibian numbers than in many other regions. Vonesh said this could be because of the use of road salts in those areas, which often run off into wetlands.

In April 2014, student representatives from each institution traveled to the NCEAS in Santa Barbara, California, to combine data and proof the research to be submitted to a conservation biology journal.

Joey Neale, a VCU graduate who attended the conference, said he jumped at the opportunity to partake in real-world research.

"The most valuable component of the class was my first experience participating in a real experiment that contributed to building upon our understanding of science," Neale said. "The most enjoyable part was meeting representatives from the other schools participating in the study and seeing our efforts come together to answer questions that our work alone would not have answered."

Provided by Virginia Commonwealth University

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