USGS
science for a changing world

Patuxent Wildlife Research Center

Statistical Research for the USGS - Amphibian Research and Monitoring Initiative

The Challenge: Since its inception in 2002 the USGS Amphibian Research and Monitoring Initiative (ARMI) has taken the lead in monitoring amphibian populations on Department of Interior lands. ARMI scientists work on a broad spectrum of species and management issues to address the core causes of amphibian declines. In many cases, research requires complex study designs and innovative methods. A key program need for ARMI has been to develop a robust set of quantitative methods for estimating patterns and dynamics of species presence.

The Science: Quantitative ecologists from the Patuxent Wildlife Research Center have been crucial in the initial development and continuing growth of the ARMI program. One of the best examples of this has been the development of a set of methods generally referred to as occupancy modeling. These methods were developed to directly address the need of ARMI scientists to monitor changes in amphibian populations across broad scales. Occupancy analysis is a sound approach to estimate changes in the proportion of sites occupied by a species that takes into account sample design and the fact that just because a species is not detected does not mean it is not there. Methods originally developed as part of this collaboration are now used in hundreds, if not thousands, of studies across the world for species ranging from honeybees to elephants.

The Future: Collaborations between ARMI scientists and quantitative support staff continue to serve as a cutting edge laboratory for new statistical methods used by scientists throughout the world. New work has focused on using occupancy analysis to study the effects of invasive species, changing habitat, and climate on native amphibian populations. Other promising innovations have focused on accounting for species mis-identification in surveys, applying occupancy methods to monitor amphibian diseases, and combining information from multiple refuges and regions to make inferences about broad-scale changes in amphibian populations. The continuing need for innovation to meet the needs of the ARMI program means that this collaboration is likely to lead to important developments in quantitative methods for monitoring population dynamics far into the future.

Contact: Jim Nichols at (301)497-5660 or jnichols@usgs.gov