Quantifying the effects of pesticide exposure on seasonal fecundity rates of birds

Richard S. Bennett and Matthew A. Etterson

U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory, Mid-Continent Ecology Division, 6201 Congdon Boulevard, Duluth, Minnesota 55804, USA

ABSTRACT

Current risk assessment practice uses the results of avian reproduction tests in risk quotients to classify the potential for pesticide use to adversely affect avian reproductive success. However, as risk assessors move toward better understanding the population-level consequences of pesticide use, there is a need to quantitatively estimate effects of pesticides on avian annual reproductive success (i.e., fecundity rate). There are no endpoints from the reproduction test that, on their own, can act as a suitable estimator of effects on fecundity, however, information from endpoints measured in the three avian toxicity tests can act as surrogates for the types of effects possible in the field. The Markov chain nest productivity model (MCnest), integrates data from several pesticide toxicity endpoints with information on avian life history and the timing of pesticide applications to simulate the effects of a pesticide-use scenario on reproductive success in a population throughout the breeding season for each species. The primary output of MCnest is the relative change in reproductive success between a defined pesticide-use scenario vs. a no-pesticide scenario. In this poster we demonstrate ways that MCnest could be used in ecological risk assessments to 1) identify which species or life history strategies are at greatest risk, 2) identify which application dates pose the greatest risk, 3) compare effects of chemicals with different modes of action, and 4) compare the effects of mitigation strategies on annual reproductive success. This abstract does not necessarily reflect EPA policy.