

A MULTISCALE INVESTIGATION OF ECOLOGICALLY RELEVANT EFFECTS OF AGRICULTURAL RUNOFF ON AMPHIBIANS

Bethany K. Williams

Dr. Raymond D. Semlitsch, Dissertation Supervisor

ABSTRACT

Modification of landscapes for agricultural production can introduce agrochemicals into surface waters and degrade aquatic habitats used by many amphibians for breeding and larval development. Although many ecotoxicological studies have shown that contaminants common in agricultural runoff have the potential to cause mortality, immunosuppression, or reproductive abnormalities in amphibians, we have a very poor understanding of how exposure to agricultural runoff may affect amphibian population persistence when exposures occur in realistic contexts.

Using laboratory studies, field studies, and landscape level surveys, I established that herbicides common in runoff can cause mortality and alter life history traits in amphibian larvae under laboratory conditions at levels as low as EPA drinking water standards, although laboratory exposures to water from agricultural streams generally enhanced larval performance. In field enclosure studies, tadpole performance in agricultural streams showed more year-to-year variability than in reference condition streams. Landscape level surveys confirmed that the majority of anurans present in the study area use streams for both calling activity and reproduction. Physical stream habitat characteristics were better predictors of capture rates than local or watershed land use, indicating that habitat availability may be an important constraint on amphibian success at stream sites.