

BEHAVIORAL CHOICE AND DEMOGRAPHIC CONSEQUENCES OF WOOD
FROG HABITAT SELECTION IN RESPONSE TO LAND USE

Tracy A. G. Rittenhouse

Dr. Raymond D. Semlitsch, Dissertation Supervisor

ABSTRACT

Land use is a pervasive form of disturbance affecting natural systems on Earth. My dissertation research is set within the context of a large scale project referred to as Land-use Effects on Amphibian Populations (LEAP), where researchers in Maine, Missouri, and South Carolina are determining the effects of timber harvest on the persistence of amphibian populations.

The purpose of my dissertation research was to define adult wood frog non-breeding habitat in continuous oak-hickory forest and in response to timber harvest. I asked research questions that address the two components of habitat selection: 1) the behavioral choice, and 2) the demographic consequences of that choice.

To document behavioral choice, I allowed adults to move freely throughout the circular experimental timber harvest arrays (164 m radius) by using standard radio-telemetry techniques. Prior to timber harvest, I found that wood frogs were not distributed equally throughout oak-hickory forest. Adults used drainages as non-breeding habitat. In addition, the number of frogs that migrated to a specific drainage correlated with the distance between the pond and the drainage.

Following timber harvest wood frogs avoided clearcuts and increased movement rates in response to timber harvest. Further, I confirmed the consistency of this behavioral response by conducting experimental displacements and found that adults exhibit site fidelity to non-breeding habitat. Frogs displaced to the center of clearcuts evacuated the clearcuts in one night of rain and 20 of 22 frogs displaced back to the pond returned to the same drainage.

To determine demographic consequences, I estimated survival of frogs constrained within microhabitats. Desiccation risks for frogs located on forested ridgetops or in exposed areas within clearcuts were severe. Brushpiles within clearcuts provided microhabitats with similar desiccation risks as microhabitats within forested drainages.

I also determined survival of translocated frogs that moved freely among microhabitats by radio-tracking 117 frogs over 3 years. I documented 29 predation events, 13 desiccation events, and 8 mortalities of unknown cause. Using Cox-proportional hazard models, I found that survival within the timber harvest array was 1.7 times lower than survival within continuous forest. Survival was lowest during the drought year of 2005 when all desiccation events occurred. My results indicated that predation and desiccation risks near the breeding ponds are ecological pressures that explain why adult amphibians migrate away from breeding habitat during the non-breeding season.