TERRESTRIAL HABITAT USE BY POND-BREEDING AMPHIBIANS IN SOUTHERN RHODE ISLAND

BY

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Abstract

Biologists are increasingly interested in amphibians and their habitat requirements because recent research has documented population declines at a variety of spatial scales. Amphibians that breed in small, seasonal pools are vulnerable to habitat degradation and loss because breeding ponds and adjacent terrestrial habitats are often inadequately protected under existing federal and state wetland regulations.

Recently, conservation biologists have stressed the importance of protecting terrestrial habitat surrounding breeding ponds – not only as a buffer zone for the ponds, but also to provide core habitat for the semi-aquatic animals that use the ponds. Yet relatively little is known about pond-breeding amphibian habitat requirements away from breeding ponds. I examined the effectiveness of three sampling techniques (plot sampling, belt transect sampling, and cover board sampling) to quantify terrestrial habitat associations of pond-breeding amphibians during the 2002 and 2003 field seasons. I estimated capture efficiency (number of animals detected per hour in the field) to calculate cost effectiveness of each technique. Plot sampling, belt transect sampling, and cover board arrays had low capture rates and were only effective at detecting Eastern red-backed salamanders (*Plethodon cinereus*). Few pond-breeding amphibians were detected with these surface sampling techniques. Cost analysis revealed that cover boards arrays were less expensive to implement than belt transect sampling or plot sampling. For pond-breeding species, belt transect sampling was least expensive.

I used an information-theoretic approach (Akaike Information Criterion) to develop habitat models to predict amphibian occurrence based on surface sampling techniques. For pond-breeding species, the best models suggested that microhabitats

with more downed coarse woody debris, greater leaf litter depth, and high numbers of vertical small mammal tunnels were selected. The best model suggested that Eastern red-backed salamanders selected microhabitats with less downed coarse woody debris, greater leaf litter depth, fewer downed logs, and avoided wetlands.

In 2003, I used radio-telemetry to assess the emigration behavior of 30 radio-implanted spotted salamanders on golf courses in southern Rhode Island. Fieldwork was conducted at an active golf course, a golf course under construction, and a closed-canopy forest that served as a control site. The mean maximum dispersal distance from breeding ponds of spotted salamanders was 145 ± 20 m (median 124 m; range 44 – 467 m), which was similar to past research. However, the maximum distance I documented was twice as far as previously published dispersal distances. Based on these dispersal distances, I calculated that a "life zone" of radius 185 m surrounding breeding ponds is needed to encompass 95% of the adult population. The chronology of movements varied among study sites, with salamanders at the golf course under construction showing more sporadic migration patterns than at the other study sites.

I used both an information-theoretic and a resource selection function approach (RSF) to develop habitat models to predict spotted salamander occurrence based on telemetry data. Habitat preferences of spotted salamanders documented during this study were consistent with previous research. Using Akaike Information Criterion (AIC), the best models predicted that spotted salamanders selected shaded habitats that provided a moist microclimate with high densities of vertical and horizontal small mammal burrows. RSF predicted that spotted salamanders selected forested wetlands to reside in during the spring and summer. My results concurred with past research that salamander movements

varied as a function of precipitation, julian date, and the number of days a salamander had been tracked.

These results suggest that existing wetland regulations in Rhode Island will not protect populations of many species of pond-breeding amphibians. Under current state law, only the basin for ponds <0.1 ha is regulated and no adjacent terrestrial habitat is protected. Given that a life zone of 185 m is needed to protect some species of pond-breeding amphibians, other conservation strategies will have to be implemented to insure the long-term viability of pond-breeding amphibian species in the state. This study suggests that maintaining extensive upland and wetland forested habitats near breeding ponds, with significant amounts of deep leaf litter, coarse woody debris, and high small mammal densities will help support pond-breeding amphibian populations in the future.