DISPERSAL ECOLOGY OF POND-BREEDING AMPHIBIANS

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Abstract

Habitat loss and fragmentation are among the primary threats to pond-breeding amphibians. Most species have complex life histories that require them to migrate annually between upland habitats and breeding ponds. Thus, habitat alteration of breeding wetlands, terrestrial habitats, and intervening habitats used during migratory events could affect populations. I monitored the migration ecology of 78 radio-tagged adult spotted salamanders (*Ambystoma maculatum*) at Lake of Isles Golf Course, CT, from March through August 2004. Animals were tracked as they emigrated from three ponds surrounded by fairways (hereafter, fragmented landscape) and one pond located in contiguous forest (hereafter, control). I also re-implanted transmitters in 26 animals from the original sample to track them from August through November to determine over-winter destinations. Female spotted salamanders ($\bar{x}$ = 136 ± 18 m, range 5 to 304, n = 25) dispersed significantly farther from breeding ponds than males ($\bar{x}$ = 91 ± 12 m, range 22 to 341, n = 40) at all ponds (p = 0.03). Emigrating salamanders on the fragmented landscape dispersed significantly farther from breeding ponds ($\bar{x}$ = 123 ± 13 m, range 18 – 341, n = 46) than salamanders on the control site ($\bar{x}$ = 73 ± 9 m, range 5 - 146, n = 19). Current strategies to conserve pond-breeding amphibians in urbanizing areas suggest protecting core terrestrial habitat surrounding breeding ponds. However, state wetland regulations in New England protect at most (Massachusetts) a 30-m terrestrial buffer zone around certified seasonal wetlands, which would only encompass 23% of adult males and 3% of adult females I monitored, leading to a strong male bias in population structure.

I also developed resource selection functions based on micro- and meso-habitat features at animal locations and random locations, and modeled spotted salamander habitat selection using an information theoretic approach. The spatial distribution of salamanders was closely associated with small mammal burrow systems, as salamanders were most likely to occur in micro-habitats with a high density of vertical and horizontal small mammal burrows. Salamanders at the contiguous forested tract selected forested areas with non-wetland soils and avoided very poorly drained soils. However, salamanders at the golf course selected either forested wetlands or forested uplands, while avoiding fairways and other developed habitats. Spotted salamanders were usually found in micro-habitats with deep leaf litter, high shrub and herbaceous cover, and dense coarse woody debris, and in areas with large trees, which agrees with past research. Golf course designers interested in protecting biodiversity should maximize forest cover to increase habitat availability for pond-breeding amphibians such as spotted salamanders. In addition, vegetative structure and coarse woody debris should be maintained in the understory to provide habitat for small mammals and salamanders.

Using pitfall trap arrays, I monitored metamorph amphibian movements across a landscape fragmented by a golf course from 13 July through 15 October 2004. In the pitfall trap arrays, I captured 13 species from a variety of age cohorts (metamorphs, subadults, and adults) in forest, fairway, parking lot, and edge habitats. American toads (*Bufo americanus*) were the dominant species in all habitats. Metamorphs of only 8 species were captured after crossing fairways, with 47% of all captures on the fairway side of arrays where animals had to cross open, grass habitats up to 85 m wide. Interestingly, species that breed in seasonal ponds comprised the majority of amphibians

captured after crossing fairways, while few juveniles of species that breed in permanent ponds apparently attempted to cross fairways. Evidence gathered during this study suggests that fairways and impervious surfaces may filter movements of some species, although open habitat was not an absolute dispersal barrier.