

# Effects of Golf Course Construction on Amphibian Movements and Population Size

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## Objectives:

1. Gather baseline data on amphibian species richness and relative abundance on selected golf courses in southern New England.
2. Assess habitat association patterns for each species.
3. Develop management guidelines that could be used to assess and enhance amphibian populations at golf courses located in other regions of the country based on this research.

**Start Date:** 1998

**Project Duration:** 3 years

**Total Funding:** \$72,000

Immigration and emigration rates of pond-breeding adult and metamorph amphibians across a forested landscape fragmented by commercial turf fields were monitored.

Adults of two species, green frog and pickerel frog, readily immigrated across a 68-meter wide turf field to reach breeding ponds, while turf limited movements by adults of six other species (wood frog, spring peeper, gray treefrog, American toad, spotted salamander, red-spotted newt).

Movements by metamorphs were less affected by forest fragmentation than adults. Capture rates of metamorphs of four species (green frog, pickerel frog, spotted salamander, red-spotted newt) were equivalent in forest interior and forest-turf edge, whereas metamorphs of four species were five times more abundant in forest-interior compared to forest-turf edge.

Results indicate that most pond-breeding amphibian species in southern New England are habitat specialists during at least one stage of their complex life cycle, adults tend to be greater habitat specialists than metamorphs, and forest fragmentation is affecting dispersal by amphibian populations in the region.

We created a series of experimental forested travel corridors during the 2000 field season. Adults of most species showed no preference for the corridors, while metamorphs of most species were more likely to use travel corridors than cross open habitats.



*The spotted salamander is one important species that uses seasonal wetlands to breed.*

Surveys of 59 ponds at 32 golf courses in southern New England found that green frogs and bullfrogs dominated most of the ponds at golf courses in the region. This is because these species prefer water bodies that are permanently flooded, as their tadpoles take one to three years to undergo metamorphosis and disperse from the pond.

In contrast, the young of other species of pond-breeding frogs and salamanders only remain in the pond for less than six months, and their young are out competed by green frog and bullfrog. A simple management solution may be to modify the hydroperiod length of a pond to increase species richness.

Finally, from 1997 to 2000, we monitored amphibian community structure in a vernal pond, which had a golf course constructed 150 meters west of the pond during the summer of 1999. During baseline years (1997-1998), we detected 11 species of amphibians, while post-construction we detected 10 species.

In general, population sizes of adults did not fluctuate dramatically following golf course construction, with the exception of wood frog, marbled salamander, and red-backed salamander. The only species that

declined as a result of golf course construction was marbled salamander.

Our research suggests that amphibians can be sensitive to habitat fragmentation, many species prefer to disperse through forested habitats rather than turf habitats, manipulating grass height does not appear to enhance amphibian movements through an area, and it was difficult to detect any obvious indication of changes in amphibian community structure when a golf course was constructed 150 meters from a breeding pond.

## Summary Points

- Results indicate that most pond-breeding amphibian species in southern New England are habitat specialists during at least one stage of their complex life cycle, adults tend to be greater habitat specialists than metamorphs, and forest fragmentation is affecting dispersal by amphibian populations in the region.
- Surveys of 59 ponds at 32 golf courses in southern New England found that green frogs and bullfrogs dominated most of the ponds at golf courses in the region.
- Population sizes of adults did not fluctuate dramatically following golf course construction, with the exception of wood frog, marbled salamander, and red-backed salamander.