Abundance and Diversity of Stream Salamanders on Golf Courses

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Objectives:

1. Measure stream salamander abundance and diversity on 10 golf courses in western North Carolina to make biologically relevant management suggestions to improve the quality of golf courses for amphibian biodiversity.

Start Date: 2008
Project Duration: two years
Total Funding: $65,800

The southern Appalachian Mountain region harbors an exceptional amphibian diversity which is dominated by salamanders. These salamanders are integral ecological components of the headwater ecosystems they inhabit where they often account for the majority of vertebrate biomass. The majority of these salamanders are found in close association with headwater stream habitats, forming communities that are comprised of five to nine species from the genera *Desmognathus*, *Eurycea*, *Gyrinophilus*, and *Pseudotriton*. These salamanders are stream salamanders of the family Plethodontidae and all have biphasic life cycles consisting of an aquatic larval stage that is followed by a terrestrial adult stage.

Stream salamanders are dependent upon both the stream and the surrounding riparian habitat for foraging, breeding, and dispersal. Though less conspicuous and least studied, the larval stage is essential to the persistence of or the reestablishment of adult salamanders in the surrounding riparian habitat.

Managing landscapes with an eye for both human use and preservation of biodiversity can create a win-win situation for stakeholders and wildlife. Considering that the average golf course consist of more than 150 acres of green space (70% is rough, non-play areas) and there are more than 17,000 golf courses in the U.S. that total over 2.2 million acres, we suggest there is great potential for golf courses to serve as sanctuaries for many wildlife species if the habitat needs of species are present.

Salamanders are integral ecological components of the headwater ecosystems they inhabit.

Our project will measure stream salamander abundance and diversity in order to make biologically relevant management suggestions to improve the quality of golf courses for stream salamanders. We will sample 10 golf courses in the montane region of the southern Appalachians within a 25-mile radius of Highlands, NC to compare to adjacent (upstream, downstream) control areas and to previous work we have conducted on national forest land.

During the 2008 summer field season, Mark Mackey (M.S. Graduate Student) and Grant Connette (Field Research Technician) were able to establish contact and participation agreements with 10 golf courses in the Highlands, NC area. They were also able to delineate streams on each course to establish six 25-meter transects (2 upstream, 2 in-course, 2 down stream) for intensive sampling during 2009. Further, they conducted a pilot project to determine the effectiveness of sampling protocols and leaf-bag sampling in different habitat types.

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They found that leaf bags were highly effective for larval salamanders and that the four primary species found in national forest streams were also present in some streams on golf courses. Intensive sampling of larval and adult salamanders on all 10 golf courses will begin next year in May through August 2009.

Four primary species of salamanders found in national forest streams were also present in some streams on golf courses.

By comparing the abundance and diversity of larval salamanders in streams and adult salamanders in the adjacent terrestrial habitat on golf courses relative to upstream and downstream areas, we will be able to assess the adequacy of current course management. We will then develop recommendations on the management of in-stream and riparian habitats on each golf course to maintain or improve habitat for salamanders.

Summary Points

- Agreements of participation were obtained for 10 different golf courses in the Highlands-Cashiers area of North Carolina.
- Six different 25-meter stream transects on each course were delineated for intensive sampling and comparison, yielding a total of 60 different stream segments to be sampled across all 10 golf courses.
- Preliminary sampling of larval salamanders was conducted to obtain the best sampling methods and a preview of species' presence on golf courses.
- A pilot project was conducted examining the efficiency of the leaf-litter bag technique as a method for sampling larval salamanders in different stream habitats.