

Health of ecosystems on US golf courses

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This is *Desmognathus ocoee*. Credit: Bill Peterman

Currently, there are more than 18,300 golf courses in the U.S. covering over 2.7 million acres. The ecological impacts of golf courses are not always straightforward with popular opinion suggesting that environmentally, golf courses have a negative impact on ecosystems. Now, researchers at the University of Missouri have determined that golf courses can offer a viable habitat for stream salamanders, and enhanced management practices may be beneficial to ecosystems within golf courses.

"If you look at the literature on golf courses, historically they get a lot of bad publicity," said Ray Semlitsch, Curators Professor of Biological Sciences in the College of Arts and Science at MU. "It's always been thought that course managers not only clear the land, but they add a lot of chemicals to the environment. In terms of maintaining the turf of the golf course, managers use herbicides, insecticides, pesticides and fertilizers. We went into the research study thinking these things were going to be really toxic and really bad to the [salamanders](#). What we found was quite the opposite—golf courses can actually provide a wonderful habitat for salamanders and other organisms where they can survive and thrive."

The study was conducted on 10 golf courses in the southern Appalachian region of western North Carolina. All courses were within a 30-mile radius of the Highlands Biological Station. Sampling focused on both larvae and adult salamanders in streams that crossed fairways within the golf courses. Water samples were also analyzed for chemicals and adverse substances that might be detrimental to the salamanders located on the courses.



This is *Desmognathus quadramaculatus*. Credit: Bill Peterman

"Surprisingly, we found no change or reduction in the abundance or diversity of salamanders downstream, which is where we expected to find chemical runoff from the upkeep and maintenance of the courses," Semlitsch said. "Golf courses have an environmental impact when they go in and clear an area; however, because of improved management techniques, we're seeing no signs of chemical effects around these courses. It implies that the turf science industry is doing a great job at utilizing fairway design techniques, plants that reduce chemicals found in the soil, and other methods to ensure that biodiversity succeeds on the course."

Semlitsch and his research team, including graduate students, Mark Mackey, Grant Connette and Bill Peterman, suggest that salamander

abundance on [golf courses](#) and related ecosystems may be enhanced through simple [management practices](#) such as retaining woody debris, leaf litter, and restoring the natural buffers between fairways and streams.

"We have this image of pristine and highly manicured fairways such as the ones we see in Augusta, or at Pebble Beach," Semlitsch said.

"However, our research suggests a more natural course that includes streams with leaf litter, sticks and twigs that offer a natural habitat for different species is preferred. Turf and golf course managers are taking note of these practices, and it is making a real ecological difference."

More information: "Do golf courses reduce the ecological value of headwater streams for salamanders in the southern Appalachian Mountains?" *Landscape and Urban Planning*, 2014.

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