Safe Harbor

Golf courses can help reduce amphibian population declines. Here's how

By Michelle D. Boone

The ponds at Hueston Woods, Golf Course in Oxford, Ohio, are a good example of managing habitat both for golf and amphibians.

If all the world's a stage, most North American amphibians play out their dramas at the pond's theater. It's a story of romance (courtship) and action (adventures, securing dinner), where the likelihood of the individual surviving to the end of the story is just 1 to 5 percent because of predators, competitors and environmental factors like drying ponds.

In the last decade, however, it has become clear that amphibians face even bigger problems in their native habitats — populations are declining at alarming rates and amphibians are now the most endangered group of vertebrates on the planet with about one-third at risk to extinction. The No. 1 cause of these declines is habitat destruction and alteration. Solving this problem will take creative solutions, particularly as the world human population continues to grow. Solutions, however, are possible and have the potential to provide a win-win situation for both wildlife and humans, in ways that may represent no or minimal costs to humans.

Golf courses are green spaces with the potential to be one part of the solution in providing habitat for amphibians and other species, because many golf courses have habitat that mimic natural environments of pond-associated species. Because there are more than 16,000 golf courses in the United States with an average size of 150 acres, there's the potential that golf courses could have a large positive impact on biodiversity.

Golf courses are designed, built and managed so that people can golf, not so that one of the world's most fascinating taxonomic groups can breed and develop. So why should superintendents or anyone bother to make changes that benefit amphibians?

First, all adult amphibians are insect-eating machines that can naturally manage insect populations to tolerable levels. Salamander larvae will also feed on the aquatic larvae of insects like mosquitoes and will keep those populations in check.

Second, most tadpoles are herbivores that feed on algae and improve the water quality of a pond — another free service that doesn't require the time and costs associated with stocking ponds with fish (which are lethal predators of most amphibians).

Third, amphibians are ectothermic, which makes them extremely efficient at transforming nutrients into body mass, thus making them an important component of the food web as prey for mammals, birds and reptiles. Studies also demonstrate that a presence of frogs resulted in greater plant growth from reducing insect abundance and from nutrient output from the digestive process.

Ways to welcome amphibians

Native amphibians are abundant in many habitats, can colonize new ponds and can use habitat created by humans if a few conditions are met. Studies with amphibians, including some of our recent research with amphibians on golf courses offer a few management strategies:

No. 1 — Eat Fish But Do Not Add Them to Your Ponds: Amphibians have their lowest diversity and abundance in ponds that contain fish. In a study with northern cricket frogs and green frogs raised with either bluegill, triploid grass carp or crayfish, the presence of either bluegill or carp essentially eliminated both amphibian species. Even herbivorous fish like carp can be lethal to amphibians, so stocking any fish is detrimental to most amphibians.

No. 2 — Let a Little Grass Grow: Most North American amphibians have complex lifecycles with an aquatic larval stage and a terrestrial juvenile and adult stage. There-

PHOTO BY: EDWARD RAMERIZ

fore, to maintain populations, adequate aquatic and terrestrial habitats are both needed. Most golf courses have ponds that could be suitable for native amphibians, but the management around the pond will make it or break it for amphibians.

First, amphibians need unmown grass or forest habitat (depending on the species) because these areas harbor food resources, and offer a refuge from predators and desiccation. Desiccation represents a major risk for amphibians. Without moist soil or a water source, amphibians can die of dehydration in 24 hours or less.

In our studies, we have found that northern cricket frogs prefer to hang out in unmown grass (over mown grass) where they lose less water and where food is abundant. Leaving a portion of the pond unmown or forested can be beneficial to amphibians and allow them to complete their lifecycles. In this way, an area that's out of play can return to a more natural state, which will provide habitat for amphibians, butterflies and plants — a benefit to wildlife, while reducing maintenance costs.

Second, terrestrial buffer zones (or areas left unmown or forested by a pond) can reduce contamination of wetlands by absorbing fertilizers and pesticides as they move through the soil.

Research shows amphibians can survive larval development at least as well in some golf course ponds as in protected wetlands. It also suggests amphibians can tolerate some level of contamination and that surrounding the pond completely with a buffer zone may not be necessary so the right of play can be balanced with wildlife needs.

No. 3 — Water is Life, Especially in Spring and Summer: The greatest diversity of amphibians is in temporary pond communities — ponds that fill in the fall or winter and dry in the late summer or fall, or dry every other year. Regular drying in late summer or fall reduces insect and fish predators, which benefits amphibians. Maintaining water in the spring and summer will help amphibians produce many juveniles that can feed on insects in the terrestrial environment and will return in subsequent years to maintain the population with a new crop of eggs. Drying ponds in the fall for pond or fountain maintenance can actually help amphibians.

No. 4 — Stay Connected: Few pond-breeding amphibians travel more than a half mile and most will not move more than one-tenth of a mile in their lifetimes. Placing ponds close enough to streams or other ponds within or outside the course when designing courses will increase the likelihood a pond will become colonized by local amphibians.

Healthy populations

There's little superintendents need to do to attract amphibians aside from having both appropriate aquatic and terrestrial habitats. Improving the chances for healthy amphibian populations most often involves not doing: not adding fish, not drying ponds in spring or summer and not mowing around the whole pond.

In studying the effects of buffer zones on aquatic and terrestrial life stages of amphibians, the superintendents we've worked with have been extremely helpful and some have been delighted to leave areas unmown for our research because it saved on maintenance costs. One golf course had signs in some unmown areas noting these "Wildflower and Wildlife Areas," which improved public perception of their management.

Sharing the positive strides that your golf course is taking to benefit wildlife will be attractive to many golfers as public awareness of the biodiversity crisis rises. Recreational activities do not have to come at a great cost to wildlife and golf courses have the potential to lead the way in wildlife-compatible development.

Golf courses have the potential to be part of the solution in providing habitat for amphibians.

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