Wetland Matters

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'Creepy' Herps Find a Place in the Ecosystem at Hennepin & Hopper

By Karen Glennemeier, Ph.D.

The word herpetology—the study of reptiles and amphibians—comes from the root *herpo*, meaning "to creep." I think it is fair to say that "creepers" have intrigued, inspired, and, yes, even charmed generations of nature enthusiasts. I know they have had that effect on me.

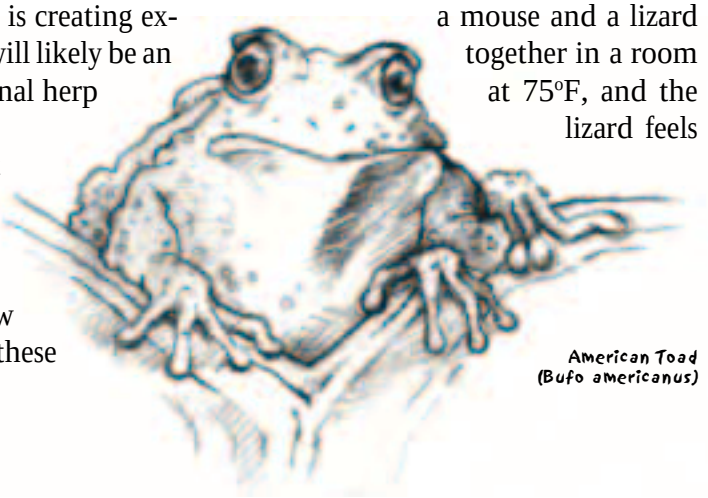
In addition to charming us, however, "herps" also tell us much about the overall health of a landscape. Salamanders, frogs, toads, turtles, and snakes need diverse, large, and wet landscapes to thrive. At the Hennepin & Hopper Lakes Project in Putnam County along the Illinois River, restoration is creating excellent herp habitat that will likely be an important factor in regional herp conservation.

What does that habitat look like and which species are likely to appear—and have appeared—at the project? And how does a scientist even find these often hidden animals? Is there a role for the citizen scientist in monitoring herps? Join me as I uncover the mysterious world of herps.

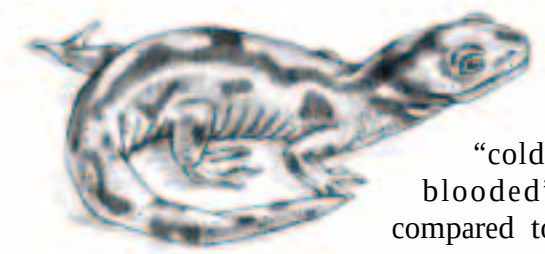
Close to the Ground

The "creepiness" of reptiles and amphibians (collectively known as herpetofauna, or herps) is largely a function of their biology. These animals are ectothermic, or what is commonly called cold-blooded. This means that they regulate their body temperatures using mainly their external environment.

In contrast, we and other endotherms (or warm-blooded animals) regulate our body temperatures internally. While our body temperatures remain nearly constant around 98°F and are closely regulated by an internal thermostat, the body temperature of an ectotherm is allowed to fluctuate much more widely and usually matches that of its environment. Put a mouse and a lizard together in a room at 75°F, and the lizard feels



American Toad
(Bufo americanus)



Tiger Salamander
(Ambystoma tigrinum)

"cold-blooded" compared to the mouse. But put them in a room at 105°F and consider which animal is now the so-called cold-blooded one.

Why does this biology make them creepy? Perhaps the main reason is that herps must stay fairly close to the ground. This is the source of much of their heat when it's cold outside, and it's how they cool off when it's hot outside. Think of the classic picture of a lizard basking on a rock. It's soaking up the heat radiating from the sun-drenched rock.

Their creepiness also comes from the fact that herps don't often move as quickly as their mammal or bird counterparts might. Everything slows down when it's colder, and unless it's 98°F, a herp's body temperature is going to be colder than yours.

On the other hand, have you ever tried to catch a frog with your bare hands or grab a snake as it races past? Unless it's really cold, most herps are capable of short bursts of speed when they need it. This creepiness makes it difficult to monitor herps in the field, which is why we know so little about them compared to other vertebrates like mammals, birds, and fish.

Aside from their inherent value, herps play an important role in the ecosystem. They are predators of insects, small mammals, bird eggs, and other herps. Without them, we might be overrun with mosquitoes, field mice, or cowbirds. Herps also are an important food source to mammals, birds, fish, and other herps. Even insects eat herps; for example, dragonfly larvae eat tadpoles. (Is it then revenge that adult frogs eat adult insects?)

Amphibians provide an extra ecosystem service: They transfer nutrients and biomass from the aquatic to the terrestrial world. Their aquatic larvae take in nitrogen, carbon, and other nutrients from a pond, stream, or wetland, and when they transform into adults, all of these materials become available to the terrestrial food chain.

Herps in Wetland Habitats

Wetlands are generally very rich ecosystems; thus, they support a high biomass and diversity of plants and animals. They serve an especially important role for amphibians because they provide both larval and adult habitat. Often the best wetlands for amphibians are those that dry up sometime during middle or late summer. These wetlands are wet long enough for the larvae to turn into frogs and salamanders and hop onto dry land, but their temporary status keeps out a major predator—fish.

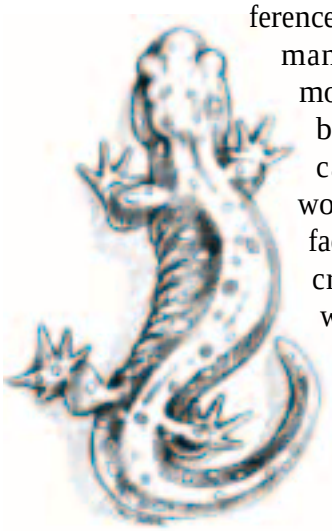
Of course, some amphibian species do just fine in permanent ponds. These species tend to have special adaptations to avoid fish predators, such as large size (think of a bullfrog or green frog tadpole). Some even prefer fish ponds because this means less competition from other, smaller tadpoles.

Still other amphibians prefer running water rather than a standing pool. These species like the high oxygen levels and plentiful, rocky hiding places of a running stream. They tend to exhibit physical traits that help them to maneuver in the running water, such as streamlined bodies and small gill structures (since they can rely mainly on cutaneous, or skin, respiration in such high

oxygen environments). Most amphibians spend only their larval phase in running water or in ponds.

It's not just water, however, that defines a herp's habitat. There's also the matter of canopy cover. A pond that is shaded by trees will tend to have lower oxygen levels and poorer food quality (less photosynthesis leads to fewer plants) than one that is out in the open. Many amphibians, such as toads and northern leopard frogs, much prefer the open ponds. Other species, (e.g., wood frogs), have taken advantage of this fact. Their tadpoles have developed the means of growing and surviving where there's less oxygen and poorer food, and they have fewer competitors in wooded ponds.

Salamanders, too, have canopy preferences. Blue-spotted salamanders like the cool, moist shade of the woods, but tiger salamanders can thrive in both woods and prairie—in fact, they tend to increase in abundance when an overgrown woods is restored to open savanna. Snakes and turtles also segregate according to canopy type.



Blue-spotted Salamander (Ambystoma laterale)

Habitat size also is important. The limited existing research suggests that habitats smaller than 300 to 500 acres will support fewer herp species compared to larger sites. Areas greater than about 800 acres are the best bet for sustainable herp populations. Why does size matter? Nobody really knows, but it could be that greater size means greater number of habitat types. The greater the diversity of habitats (or the number of ecological niches), the greater the diversity of species since different species have different habitat needs.

The size issue also could relate to "edge effect." Picture a circular wetland preserve surrounded by farmfields. At the edges of the wetland, there is likely to be a greater concentration of fertilizer and herbicides compared to the wetland interior. There also will be a greater concentration of predators such as field mice, raccoons, or other animals that thrive in disturbed or human-altered habitats. Larger natural areas have a lower edge-to-interior ratio than smaller areas of similar shape, so herps have a better chance of avoiding the hazards associated with the edge.

Diversity

What does all of this mean for wetland restoration? What's the best habitat for the most kinds of herps? It comes down to a familiar word: diversity. A diverse habitat means a diverse suite of species, for herps as well as other taxa.

The Wetlands Initiative's Hennepin & Hopper Lakes Project is an excellent example of such habitat diversity. It has open water lakes, shallow wetlands, wooded ponds, and open savanna. The potential for a diverse assemblage of herps is high.

Hennepin & Hopper Lakes also satisfies a herp populations' need for space. At 2,600 acres, the project promises to be a haven for herps. The restored habitat should have more than enough room for the full suite of species one would expect to find in a wetland-prairie complex in Illinois.

Of course, there are still many subtleties of habitat restoration that we don't yet understand. While we can make some

Reptile and amphibian species currently or historically found in Putnam or nearby counites

Tiger salamander*†
American toad
Fowler's toad*
Cricket frog*
Gray treefrog
Spring peeper
Western chorus frog
Plains leopard frog*†
Bullfrog
Green frog
Northern leopard frog
Snapping turtle
Painted turtle
Map turtle
Ornate box turtle
Red-eared slider turtle
Musk turtle
Spiny softshell turtle
Racer snake
Fox snake
Western & Eastern hognose snakes
Northern water snake
Smooth green snake *†
Brown snake
Plains garter snake
Common garter snake

Bold face indicates species seen or heard at Hennepin & Hopper Lakes Project, Putnam County, Illinois, in Spring 2001.

**Pre-1980 sighting only (species in bold, however, also appeared in the 2001 survey)*

†*Sighted in nearby counties, but not in Putnam County*

Note: No records of any venomous snakes in Putnam county.

general statements about high quality habitat (i.e., large size, diverse habitats, diverse hydrology), we still don't know enough about herp habitat requirements to know precisely what habitat features will ensure a successful restoration. Because the Hennepin & Hopper Lakes Project gets high marks in the important habitat conditions that we *do* know something about, the odds of a successful restoration for herps are quite good at this site.

Which Species?

Which species of herps might we expect to find at the Hennepin & Hopper Lakes restoration area? The list includes about 26 species that have been known to occur in the region and in the type of habitat found at Hennepin & Hopper (see box at left). Each of these species requires a slightly different habitat, so the diversity of hydrology, canopy cover, and vegetation types at Hennepin & Hopper increases the number of species we're likely to see. We won't likely find all 26 possible species—this would be a tall order for any habitat—but we're likely to find quite a few.

Tiger salamanders, spring peepers, painted turtles, and fox snakes are some of the species with which many of us are familiar. But we might also find cricket frogs, which used to be common but have been showing steep population declines in the northern part of the state.

A rare treat would be to find *both* the plains and the northern leopard frogs. The plains leopard frog is typically found in the southern part of the state, while the northern leopard frog sticks to the north. Hennepin sits in the transition zone where both species co-exist. This site could be a

great place for an evolutionary biologist to study the mechanisms that maintain species distinctions. We also might find the spiny softshell turtle—an unusual-looking turtle with a flat, soft shell and a long, squared-off nose.

Frogs came quickly

In the spring of 2001, some amphibian surveys were conducted at Hennepin & Hopper Lakes, just as the pumps were turned off and water levels started to rise. Frogs were the most thoroughly surveyed, and seven species (see bold face in box on page 4) were seen or heard, including the cricket frog (*Acris crepitans*), whose numbers have declined in northern Illinois and throughout the upper Midwest. This is seven species out of about 10 that are likely to occur in this region and habitat.

A remarkable part of these observations is the speed with which the frogs responded to the rising water levels. On the first visit to the site in early April 2001, there were about 10 individual frogs calling from the small ponds in the woods at the southeast corner. They were western chorus frogs (*Pseudacris triseriata*)—whose call is a rising trill, like a finger running across the teeth of a comb—and spring peepers (*Pseudacris crucifer*) who release a simple "peep" that is astonishingly loud.

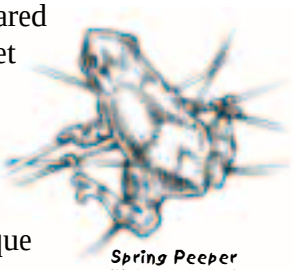
Two weeks later, after the pumps were turned off and water had slowly begun to overflow the banks of the ditch and spread out over the fields, the wet interior of the site was filled with hundreds of calling frogs. Chorus frogs and spring peepers were present in much greater numbers than before, and they were joined by American toads (*Bufo americana*) and gray treefrogs (*Hyla versicolor*). These species breed in late April.

It was striking how quickly the frogs took to the new water. The site was nowhere near an intact wetland ecosystem yet; it was just wet. How did the frogs know it was there? Where were they before the pump was turned off? Did their tadpoles find enough to eat or have enough shelter from predators? What will the site sound like as it begins to look more like an intact wetland ecosystem? We don't know the answers to these questions, but we do know that Hennepin & Hopper Lakes are already showing great potential for herp habitat.

Finding Herps

One of the reasons we know so little about herps is that they are very difficult to monitor. Calling frogs are easy to find, but they are the only type of herp that is so vocal. Even a calling frog can be difficult to observe, catch, or count. Many a seasoned herpetologist has stood directly over the spot where a chorus frog is calling, unable to see the frog itself. So, while one can easily record the presence or absence of frog species, it is difficult to obtain an accurate estimate of population size.

There are several different means of monitoring herps in the field. The best bet for accurate population abundance estimates is to use as many different monitoring techniques as possible, since each technique is geared toward a different set of herp species.



Spring Peeper (Hyla crucifer)

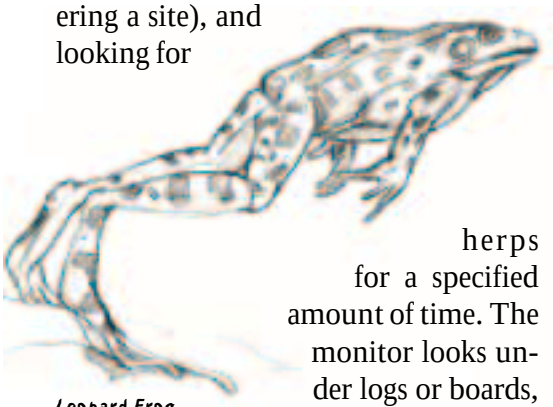
One of the most reliable means of estimating population size is a technique called the drift fence.

This method places a long sheet of thin metal or other durable material along the ground, like a fence that is a several feet tall. A pitfall trap—a container dug into the ground that is deep enough to preclude the escape of any herps that fall into it—is placed at either end of the fence. Herps who are migrating to or from a breeding pond, for example, run into the fence, then start walking along it looking for a place to cross. At the end of the fence, the animals fall into the traps. The monitor checks the traps at least once a day to count and then release any trapped herps.

While the drift fence method is one of the most reliable means of estimating population abundance for some species, it also is very labor intensive and can be costly, depending on the length of the fences. It is most appropriate for species that migrate to and from a breeding pond or other discrete location that concentrates animals in one place.

Visual Encounter Survey

A simpler means of monitoring herps is to use a visual encounter survey (VES). This method involves simply meandering over a site (or using a more systematic, unbiased means of covering a site), and looking for herps for a specified amount of time. The monitor looks under logs or boards, scans ponds for basking animals, and searches the ground for herps. At night with a headlamp, one can catch the eyeshine of a frog whose head is peeking above the water—a frog nearly impossible to see during the day.



Leopard Frog
(Rana pipiens)

The VES is a very useful technique, but, like every technique, it has its limitations. Some species are more likely than others to be spotted with a VES. Smaller, reclusive, or fossorial (ground-dwelling) species are unlikely to be counted as often as their larger, more active counterparts. The number of animals spotted varies with the experience or skill of the observer—some people (especially children) are better at spotting herps than others. But if the same people are conducting a VES at different sites, one can make accurate comparisons of herp abundances among sites. Nothing beats the VES for simplicity and accessibility.

The VES can be modified to increase the chances of finding certain groups or species. For example, snakes tend to congregate in cool, dark places and can be difficult to spot in a routine VES. A large, light board of plywood or sheet metal provides excellent cover habitat for smaller snakes. So one can place several of these cover boards throughout a site and go back later to check under each board for snakes. If done systematically over time, this method can tell a monitor whether populations are increasing or decreasing.

Since amphibians tend to lay their eggs in discrete ponds, monitoring their larvae can be a practical means of gauging reproductive success and tracking population sizes over time. Larvae can be monitored with a modified VES, where dipnets are swept through the water repeatedly and all caught larvae are counted, captured, and released back to the water after the search is completed.

A limitation of larval surveys is that many of the animals counted are likely to die before they reach adulthood, making it difficult to estimate true population size. Each frog, toad, or salamander lays hundreds or thousands of eggs each year, in the hopes that just a few will survive to reproductive adulthood. Mortality in the larval stage is naturally very high, so when monitoring larvae it's important to get some sense of adult population sizes as well.

Of course, one of the most enjoyable and easily learned means of monitoring herps is the calling survey for frogs and toads. By returning to the same pond three or more times over the spring, one is likely to hear all of the species that are breeding in that pond. It isn't possible to count every frog, but one can get a general sense of abundance and can monitor the loss or gain of new species.

By using more than one of these monitoring techniques, one can obtain reasonably accurate estimates of population abundance for most herp species. With most of these methods, the more people conducting the monitoring and the more hours they log, the more accurate will be the population estimates.

With this in mind, many states, cities, and regions are implementing citizen science programs that engage community members in the monitoring of calling frogs and toads. For example, the Chicago region has over 200 people that regularly monitor these animals in eight different counties. Some citizen scientists are beginning to branch out and monitor other herps as well. Engaging the community in monitoring herp populations is a great way to cover a lot of ground, enrich people's lives, and develop a better understanding of these oft-maligned animals among the citizenry as well as the scientific community.

In the Future

The size, habitat diversity, and hydrologic regime at The Hennepin & Hopper Lakes Project create a system that is very rare today and very much needed by amphibians, salamanders, reptiles, turtles, and snakes. With thorough monitoring, we can learn which species are thriving and which are not, and perhaps we can learn why, so that future restorations can benefit from this knowledge.

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The Wetlands Initiative is a nonprofit corporation dedicated to restoring the wetland resources of the Midwest to reduce flood damages, improve water quality, and increase wildlife habitat and biodiversity. Our mission is to promote restoration in ways that provide environmental and economic benefits to society and the landowner. Through research, education, public policy analysis, and large-scale demonstration projects, TWI aims to restore one million acres by the year 2010. While this number may seem large, it represents only two percent of the wetlands lost in the Midwest.

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