

Amphibians



Burned-Tiger Salamander
Image: MichaelCravens.com

Junior Varsity **Lake Shelbyville Eco-Meet 2013**



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What Is an Amphibian?

Amphibians are animals that live part of their lives in water and part on land. Amphibians are vertebrates, and are also ectothermic, or “cold-blooded.” They cannot regulate their own body heat, so they depend on the heat from sunlight to become warm and active. They can’t cool down on their own, so if they get too hot, they seek a burrow or some other source of shade. In cold weather, they tend to be sluggish and limit their movement. Amphibians spend winters underground. Strictly speaking amphibians do not hibernate. Rather than true hibernation, they enter a state of torpor in winter. The animals become less active as the temperature drops and find themselves unable to warm up. They do not, however, go through any major physiological change. They may wake during periods of warmer weather and briefly become active. Toads, newts and most frogs will over-winter in sheltered places on land. However, some frogs will over-winter at the bottom of a pond.

There are about 5,500 known species of amphibians, divided into three main groups: salamanders, newts, and mudpuppies; frogs and toads, and caelilians, legless worm-like animals, found primarily underground, in rain forests.

From Tadpole to Frog—Metamorphosis

Amphibians go through a two-stage life cycle. The eggs do not have shells must be laid in water or a damp environment to keep from drying out. When an amphibian hatches it is in a gilled larval form. Young amphibians do not look like their parents. After a few weeks or months the larvae transform into the adult form of a frog or salamander—a process called metamorphosis. A frog starts out as a tadpole with gills to breathe underwater and a tail for swimming. As it gets older it develops lungs, legs, and a different mouth. Its eyes change position and it loses its tail. At this point it has reached maturity and will spend most of its time on land, rather than swimming in water.

Moist is Best

Most amphibians have soft, moist skin that is protected by a slippery secretion of mucus. They tend to live in moist places or near water to prevent their bodies from drying out. Many adult amphibians also have poison-producing glands in their skin, which make them taste bad to predators and might even poison a predator that bites or swallows them. Some of these amphibians, like poison dart frogs, are brightly colored as a warning: they are extremely toxic.

Because of its size and location in the central part of the United States, Illinois is populated by a rich variety of amphibians, numbering 41 species. This includes 20 species of salamanders, 21 frogs and toads.

Food and Feeding

Most amphibians are predators of a wide variety of animals, including other amphibians. Some are omnivorous, eating animals and plants, and some are herbivorous, eating only plants.

Salamanders, both larvae and adults, are generalized predators; eating about any other animal they can capture and swallow, including fish, insects, crayfish, and snails. Salamander larvae begin life eating tiny, almost microscopic, animals known as plankton. As they grow, they accordingly eat larger and larger prey. Aquatic salamanders capture prey by lunging and simultaneously opening the mouth and expanding the throat to draw in a rush of water. Because this method does not work in air, terrestrial salamanders simply grasp worms, insects, slugs, and snails, and so forth with their jaws or use their protrusible, sticky tongues to pull prey into their mouths.

Most frog and toad tadpoles scrape algae and bacteria from substrate and filter them from water, or scavenge decaying organic matter. Adults are mostly insectivorous, capturing a variety of insects with their protrusible, sticky tongues.

Reproduction and Calls

Though most frogs and salamanders reproduce during spring, that's where the similarities end. Frog breeding is a clamorous, raucous affair whereas breeding salamanders are secretive and quiet. The prominent calls made by males during the breeding seasons are termed *advertisement calls* because they advertise the presence of breeding males. Male frogs attract females to breeding sites by species-specific vocalizations. When many individuals of several frog species call simultaneously, the result can be deafening—while a call is likely to attract receptive females, it may also attract other males to the breeding chorus. Males usually arrive at the breeding site before females. When a gravid female approaches a male, he climbs on her back and holds on to her with his forearms around her body (a behavior called amplexus). A short time later the female releases eggs into the water and the male fertilizes the eggs by expelling sperm on top of them.

The frog call itself is produced in a male's vocal pouch. The pouch inflates while calling, adding loudness and resonance to their calls. Tree frogs, true

toads, and other groups typically possess a spherical, thin-walled pouch that is inflated like a balloon. Many true frogs have paired vocal pouches which extend outward to each side.

Bullfrogs and other species have less defined, thick-walled pouches. When calling their throats bulge outward from one side of the mouth to the other.

If one walks along the shores of lakes or ponds during the summer months, alarmed frogs periodically leap from the shoreline, squeaking loudly before splashing into the water. Such *alarm calls* are commonly given by members of the family Ranidae, many of which spend a great deal of time waiting for insect prey at the water's edge. The function of these calls remains unknown, but they do seem to alert other frogs to approaching danger and they may startle potential predators. When seized by a predator, a variety of species emit loud, wailing screams of cries, often with their mouths open. These *distress calls* will hopefully induce a predator to drop the prey, allowing a quick escape.

Rather than vocalizing, male salamanders entice females to engage in a ritual courtship behavior through an exchange of chemical cues, or pheromones, produced by specialized glands and released into the water or onto the body. During courtship, the male, except the hellbender, deposits spermatophores (small gelatinous pyramids capped with spermatozoa) and leads the female over them. With her cloaca, she removes spermatozoa, which are stored in a special sac-like structure. The eggs are then fertilized inside the female's body. Rather than producing spermatophores, male hellbenders simply spread spermatozoa over eggs left in a gravel depression by one or more females.

In the life history of most amphibians in Illinois, eggs laid in water develop into aquatic larvae that grow and transform into juveniles that resemble adults in body form. In the hellbender, mudpuppy, and lesser siren salamanders, larvae mature without transforming and never leave the water. Woodland salamanders bypass the larval stage altogether. They lay eggs on land and embryonic development is modified so that hatchlings resemble adults in body form. The external gills, conspicuous on salamander larvae, are concealed in tadpoles beneath an operculum on each side of the head.

Glossary of Amphibian Terms

Adpressed limbs - front leg extended backward and the back leg forward in an attempt to overlap the limbs

Amplexus - embrace used by amphibians during mating; initiated by the male.

Cloaca - internal chamber at the base of the tail that receives the digestive, urinary, and reproductive tracts

Dorsal - upper surface or back

Dorsolateral fold - ridge or fold of skin along the side of the back of frogs

Eft - terrestrial stage in newt's life cycle between metamorphosis and first return to breeding pond as aquatic adult

Gill filament - smallest (secondary) branch of the external gill

Gill slit - the slit or hole through which water passes from the throat to the exterior

Gravid – a mature, egg-carrying female.

Larva (pl. larvae) - the immature form; in amphibians, aquatic with fins and gills

Metamorphosis - the change or transformation from larva to juvenile

Operculum - flap of skin covering the gill slit in tadpoles

Oviduct - tube that carries eggs to the cloaca

Parotoid gland - poison-producing gland on the top of a toad's head, usually behind the eye

Riparian - found along rivers and streams

Spermatophore - structure produced by most male salamanders that includes a gelatinous stalk with a packet of sperm on top

Tympanum - rounded, external eardrum on the side of the head

Tympanic fold - fold of skin around the eardrum

Vent - external opening of the cloaca

General Salamander Characteristics

Salamanders externally are characterized by short bodies with long tails, 4 legs with clawless toes, and well-developed heads, with large mouths and eyes. Salamanders range from the smallest at about 5 cm (2 in) to the largest, the giant salamander, *Andrias japonicas*, that may be up to 180 cm (70 in) in length and about 25 kg (55 lb) in weight. Their skin is usually smooth and moist and without scales or external ear openings. Salamanders can be brightly colored, often brown, black, yellow, or red, and usually have light or dark spots, bars, or stripes.

Salamanders possess a variety of sensory abilities. They are deaf to airborne sounds but hear or feel by sensing vibrations from the ground. Though they have relatively good vision, but do not possess the ability to produce sounds. Salamanders have a keen sense of smell and taste largely attributed to their sensitive tongues, packed with various types of nerve endings. Their mouths contain small teeth implanted on the margins of the upper and lower jaws and in some cases the roof of the mouth. Salamander's skin contains many glands, some secreting mucus to help maintain moisture and others secreting a toxic or irritating substance when the animal is frightened.

Salamanders molt their skin, from every few days to every few weeks, depending on the species and except in very cold weather, when molting ceases completely. They do not hibernate, as salamanders do not have the required mechanisms found in warm-blooded animals to support the process.

The animals have the amazing ability to shed their tails and grow them back, as well as regenerate other damaged or severed parts of their body.

Salamanders can swim like eels, using body muscle contraction to propel themselves through the water. They use their limbs very little in swimming. On land, the limbs give considerable propulsion to the body. They walk one leg at a time in a diagonal pattern. The limbs are sprawled out from the body, and the middle of the trunk usually rests on the ground.

Salamanders have a three-chambered heart and its respiratory system involves gills in the larvae stage and lungs in the adults. Oxygen intake can also occur through the skin and the mouth membranes.

Salamanders can live in a variety of environments. They absorb water through their skin, and thus always require a relatively cool, moist habitat. They may live permanently in freshwater (aquatic), part of the time in water (as larvae and to breed), (semi aquatic), or entirely on land (terrestrial).

Mature salamanders are nocturnal and carnivorous, feeding on insects, worms, and other similar small prey, and even other salamanders. Most adults hide by day and feed at night, and some emerge only when moisture and temperature levels are suitable.

Salamanders can have a life span of from 1 to 60 years depending on the species.

FROG IDENTIFICATION:

Students will be responsible for the identification of the following frogs, including their calls. Included in each frog's description is online link to a recording of its call. Participants are encouraged to search online for additional recordings in order to enhance their listening identification ability. No scientific nomenclature is necessary for



BULL FROG

Notes: Our largest native frog; grows to 6 to 8 inches in length; ranges throughout the state. Aquatic during active season; found in lakes, ponds, and streams. Avoids temporary bodies of water.

Voice:

http://www.umesc.usgs.gov/terrestrial/amphibians/armi/frog_calls/bullfrog.mp3

Advertisement call of male is a series of loud, resonant bass notes sounding like *rumm...rumm...rumm...* or else a stuttering *ru-u-uuu-umm..ru-u-u-umm...* (Often verbalized as “jug-o-run” and somewhat resembling the bellowing of a bull). These calls function both as breeding calls and territorial calls. An abrupt, spit like *phhoot!* is given during aggressive encounters. Calls from shallow water along shorelines or from offshore patches of floating or emergent vegetation can be heard from May to August.



GREEN FROG

Notes: Grows to about 4 inches long, primarily aquatic in habitat. Found along the edges of ponds, lakes, streams, and other permanent bodies of water.

Voice:

http://www.umesc.usgs.gov/terrestrial/amphibians/armi/frog_calls/green_frog.mp3

Advertisement and territorial call of the male is an explosive, throaty *gunk!* Or *gung!* Resembling the sound made by plucking a loose banjo string. Calls often delivered in a series that drops lightly in pitch and volume; *Goonk!-gunk!-Gunk!* During encounters may give several stuttering, guttural calls of *ru-u-u-u-ng...ru-u-u-u-ng* followed by a single staccato *gunk!* When aroused, may also give an abrupt hiccup sounding like *iCUP!* When approached, leaps from shoreline and squeaks in alarm just before hitting the water: *eeek~!!* Breeds from spring to later summer; calls from shoreline or from floating vegetation.



WOOD FROG

Notes: Up to 3 inches long. Terrestrial outside the breeding season; prefers moist, wooded areas.

Voice:

http://www.umesc.usgs.gov/terrestrial/amphibians/armi/frog_calls/woodfrog.mp3

Advertisement call of male is a duck-like quacking or cackling, usually consisting of several harsh notes given in rapid succession, *cack-a-hack* or *cack-a-hack-a-hack*, often delivered in a repetitive fashion: *r-r-racket*, *r-r-racket*, *r-r-racket*. Breeds after first spring rains, sometimes with snow still on the ground. Males gather in woodland pools and roadside ditches and call excitedly while floating in the water. Breeding lasts only a week or two if suitable weather persists.



PLAINS LEOPARD FROG

Notes: Grows to 4 inches or longer, spotted frog, closely resembling other leopard frog species.

Voice:

<http://ndis.nrel.colostate.edu/herpatlas/coherpatlas/MP3Sounds/pleopard.mp3>

Advertisement call consists of two to four throaty, *chucking* notes repeated several times in rapid succession: *chu-hu-huck*, *chu-hu-huck*, *chu-hu-hunk*, or *hi-hi-hip*, *hi-hi-hip*, *hi-hi-hip*. Each outburst of chucks rises slightly in pitch and ends with an accent, a soft *grunt* may terminate a series. Males also produce squeaking notes reminiscent of the sounds made by rubbing one's finger across the surface of an inflated balloon. Breeds in early spring, following the first warm rains.



NORTHERN LEOPARD FROG

Notes: Up to 5 inches long; breeds along vegetated margins of ponds, lakes, and streams. A common spotted frog popularly known as “meadow frog” due to its habit of visiting grassy meadows and lawns.

Voice: <http://www.cmnh.org/site/Files/media/leopard.au>

Breeding call of male is an extended, rattling snore lasting about three seconds or longer and usually followed by various *grunts* or *chucking* notes. An early spring breeder; may be heard calling both day and night during the first warm spells of spring.



PICKERAL FROG

Notes: Grows to 3 inches or longer. A spotted frog can be recognized by two distinct rows of squarish spots running down its back (leopard frogs have roundish spots). Breeds in spring in lakes, ponds, streams, bogs, swamps, springs, and in twilight pools at cave entrances. Also frequents grassy areas away from water.

Voice:

http://www.wildlifeofct.com/websitesounds/pickerel_frog_call_lang_elliott.mp3

Advertisement call is a harsh snore of about a two-second duration (the snore of the Northern Leopard Frog is more extended). Males sometimes call while submerged. Garbled, throaty notes are occasionally given singly, perhaps during aggressive encounters.



CRAWFISH FROG

Notes: Grows to almost 4 inches long; habits similar to the Gopher Frog. Prefers moist prairies, pastures, and meadows where it takes shelter by day in crawfish burrows of other animals.

Voice: <http://asm.wku.edu/froglogger/crayfishfrog.mp3>

Advertisement call is a low, rumbling snore usually lasting less than one second: *wwwahhhhhh*. May precede snores with soft, stuttered *chucking* notes. During aggressive encounters, makes abrupt, nasal notes: *wah!...wah!...wah!...* May be heard calling from early spring to early summer.



NORTHERN CRICKET FROG

Notes: Grows to about 1 ½ inches long; a small warty frog with non-climbing habits. When disturbed, leaps an extraordinary distance for its size.

Voice:

http://www.wec.ufl.edu/extension/wildlife_info/frogstoads/wav/northern_cricket_frog.wav

Advertisement call is a vibrant series of metallic notes that sound like two small glass marbles being tapped together: *giick-giick-giick-giick-giick-giick...* Notes are usually given in a long series that starts out slow, speeds up in tempo, and then slow down at the end with extended notes. Call has a vibrant quality because notes are slightly modulate or tilled. Breeds from late winter into summer; calls from open or grassy edges of ponds, lakes, creeks, and swampy areas.



BIRD VOICED TREE FROG

Notes: Grows to nearly 2 inches long. Spends time feeding quietly in trees or shrubs in wooded swamps and river bottoms.

Voice:

http://www.wec.ufl.edu/extension/wildlife_info/frogstoads/wav/bird_voice.wav

Advertisement call is a rapid series of ten to twenty melodic peeps lasting several seconds and sometimes varying slightly in tempo. During aggressive encounters, responds with a harsh trill given singularly or in repetition: *prrrreeek!* Breeds in ponds and pools or swampy areas, usually near rivers or creeks.



GREEN TREE FROG

Notes: Grows to about 2 1/2 inches long. Normally bright green, but may change color to dull yellow or gray.

Voice:

http://www.bio.davidson.edu/projects/herpcons/herps_of_nc/anurans/hylcin/Green%20Treefrog.mp3

Advertisement call is a harsh, nasal *quank-quank-quank-quank*, repeated once per second. From a distance, calls may sound bell-like, which accounts for the local name of “cowbell frog.” Aggressive call given during encounters is a hoarse, garbled *quarr-quarr-quarr*...that is harsher than advertisement call and repeated more quickly. Called “rain frog” because huge choruses erupt after warm rains. Breeds in still water swamps, marshes and ponds.



GRAY TREE FROG

Notes: Grows to almost 2 1/2 inches long. Individuals can change color from gray to green. Spends most of its time above ground, looking for insects in trees and shrubs.

Voice: http://www.wildlifeofct.com/websitesounds/gray_treefrog_call.mp3

Advertisement call is a short melodic trill lasting about one-half second and repeated every few seconds. When approached by another calling male, responds with squeaky chirps or yelps that signify aggression. Breeds from late spring into summer in ponds and pools surrounded by shrubs or trees. In summer, may trill from trees or shrubs.



SPRING PEEPER

Notes: Grows to about 1 ½ inches long. Scientific name *crucifer* refers to crucifix-like “X” on its back. Not often seen outside the breeding season when it looks for insects in shrubs, trees, or on the ground.

Voice:

http://www.umesc.usgs.gov/terrestrial/amphibians/armi/frog_calls/spring_peeper.mp3

Advertisement call is a series of sharp, piercing birdlike peeps repeated about once per second or faster (but never as fast as calls of the Bird-voiced Tree frog). Distant choruses may sound like the jingling of sleigh bells.

Breeds in pool, ditches, and ponds, from spring to early summer.

Aggressive call is a short, stuttering trill, *purrrreeek* usually rising in pitch at the end. Rain call, given periodically from trees and shrubs in summer and fall is a repeated series of peeps or squeaks that are harsher and more dissonant than springtime advertisement calls.



PLAINS SPADEFOOT

Notes: Grows to 2 ¼ inches long. Found in dry, sandy soils.

Voice: <http://content.lib.utah.edu/cdm/ref/collection/wss/id/1802> (*Scroll down to 'links to media section' for recording*)

Primary advertisement call is a snore-like growl, repeated once every 1-2 seconds. It is higher in pitch and shorter in duration than the snores of leopard frogs or the Pickerel Frog. May also make a nasal bleat. Breeds in pools, ditches, and flooded areas in spring or summer, after warm rains.



EASTERN AMERICAN TOAD

Notes: Grows to over 4 ½ inches long; a well-known “hop-toad” of yard and garden. One of the most common and widespread of the Eastern United States toads but easily confused with Fowler’s Toad, with which it hybridizes. Frequents a variety of habitats, from urban and suburban areas to deep forest. Night-active, hides during the day.

Voice:

http://www.umesc.usgs.gov/terrestrial/amphibians/armi/frog_calls/american_toad.mp3

Advertisement call is a long, dreamlike, musical trill lasting from several seconds to 30 seconds or more (average duration around 10-15 seconds). Each male in a chorus sings at a slightly different pitch. Males alternate and overlap their calls in a pleasing manner. Hybridizes with Fowler’s Toad. Hybrids produce a harsh trill that is intermediate in quality and duration between the typical calls of the two parental species. Breeds in the spring.



FOWLER'S TOAD

Notes: Grows to about 3 ½ inches long. Easily confused with American and Southern Toads and will hybridize with both.

Voice:

http://www.wec.ufl.edu/extension/wildlife_info/frogstoads/wav/fowlers_toad.wav

Advertisement call is a buzzy, nasal trill lasting from 1 – 5 seconds; *waaaaaaaaa!* Sounds somewhat like baby crying. Calls of hybrids are usually intermediate in quality between calls of parent species, both in harshness and duration. May be heard calling in summer from lakes, ponds, rivers, ditches and pools.