



Wood-edged wetlands offer refuge to the red salamander where it can hide beneath fallen logs, stones and mosses.



Figure III-3, This bullfrog tadpole has progressed to where legs have developed, and only the tail remains to be absorbed before transformation into the adult is complete.



Figure III-4, The "hop toad" commonly found in gardens throughout the state is often identified as the eastern American toad.

Figure III-5, The yellow throat helps identify the male green frog.





Figure III-1, Small woodland ponds are critically needed by several species of frogs and toads.



Chapter III

Figure III-2, The pickerel frog's squarish spots contrast dramatically with its lighter body color.

FROGS & TOADS

Order Salientia

Chapter III—The Frogs and Toads

Frogs and toads are usually easy to identify as a group, although there may be some difficulty in distinguishing between the species or even in separating frogs from toads. In Pennsylvania, neither has tails when fully grown and they are the only amphibians without tails. Considering they are “jumpers” rather than “walkers,” tails probably would do no more than hamper their progress. These amphibians have short, rigid backbones with at most, nine vertebrae, far fewer than other amphibians. The backbone ends in a pelvis that has been greatly modified. Widely separated, it has in its center a small set of unused tail bones fused into a single bone. The shock of landing after a long leap is absorbed by one of the vertebra, the flexible sacral joint.

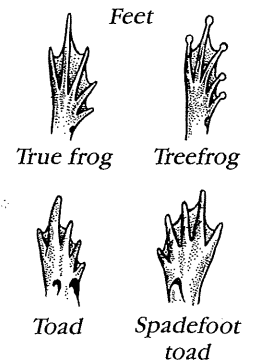
The forelimbs are well-developed on both frogs and toads and the hind legs even more so. The hind leg is larger, benefiting from an additional “joint” that is actually an extension of functional foot bones. Frogs that live most of their lives in water tend to have longer hind legs than the more terrestrial species. The legs of the toad are a bit shorter than the frog’s and account to some degree for a toad’s hopping about more so than leaping as frogs do. There are no claws on the toes of Pennsylvania frogs or toads. The treefrogs, however, have sticky pads or discs on the underside of the toes, and this feature can be helpful in distinguishing treefrogs from other frogs and toads (See Figure III-6).

An external eardrum (See Figure III-7 and III-11) marks a well-developed hearing system. Frogs and toads have internal lungs but also breathe through the skin as do many salamanders.

The frogs and toads possess true vocal chords and produce a call or song. The call of each species is distinctive and with some practice can be employed by naturalists to distinguish between the various species. In almost all cases, only the male calls. The call is used by the frog or toad to summon his mate, issue a distress call to other frogs and to protect its territory by driving off any would-be intruder.

Most frogs and toads return to the water to breed, although some deposit their eggs in a moist area on land. In mating, the male clasps the female around the body with his forelegs in a position referred to as amplexus. The eggs are fertilized externally as they are released by the female. The eggs develop and hatch to produce tadpoles, a gill-breathing larval stage, which later transforms through metamorphosis into young frogs or toads. Unlike

Figure III-6



Frog

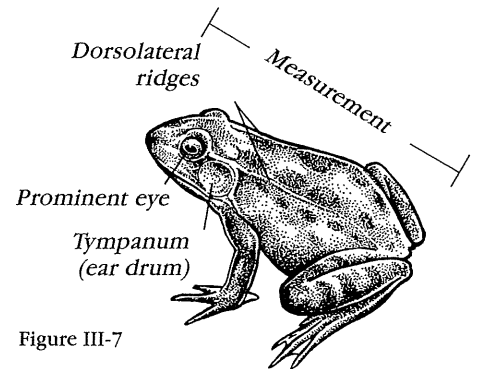


Figure III-7

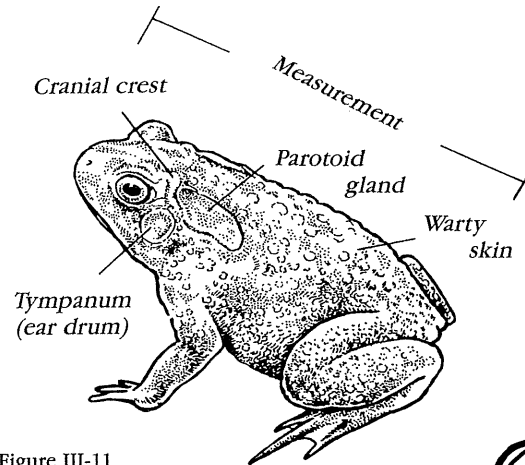


Figure III-11

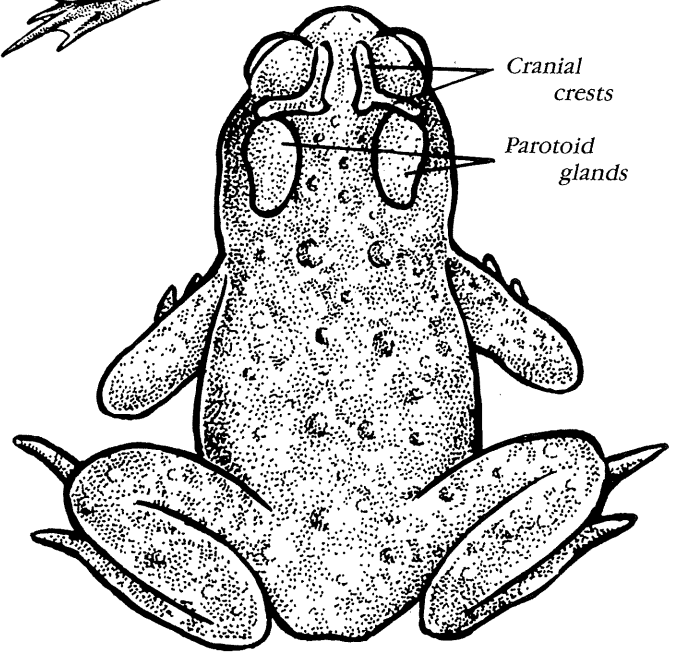


Figure III-12

adult frogs and toads, the tadpoles have a tail; it is an important appendage in moving through the water.

Toads can be distinguished from frogs in several ways. Toads have dry, warty skin compared to the relatively smooth, moist skin of the frog. The toad's legs are shorter, and a pair of parotoid glands are found on the head (See Figure III-11). The position of these parotoid glands in relation to the cranial crests (body ridges over the eye) can be used as an aid in distinguishing between the species of toads (See Figure III-12).

In spadefoot toads the parotoid gland is nearly indistinguishable. Also, each hind foot has a single, sharp, black spade.

In all cases, adult frogs and toads are carnivorous. In turn, most are preyed on by snakes, small mammals and even some fish. In Pennsylvania, there are four families, six genera and 16 species and subspecies of frogs and toads. Worldwide there are some 3,500 species; they are the most numerous of all the amphibians.

A Sac Full o' Sound

Among the amphibians, the frogs and toads are capable of producing the most distinctive and greatest variety of calls. Even though the female frogs and toads are able to call, they do so infrequently. The males do most of the calling, and the majority of the singing is done at the breeding sites, because the main purpose of the call is to attract a mate. However, a different call may be used to stake out a territory, the frog or toad announcing his presence and in effect warning others away.



Figure III-8

When calling, the throat sac on the eastern American toad expands to a size nearly equal to the head.

The time of the year when frogs or toads begin their calling varies with species and depends on weather and temperature. Some species may begin as early as late February, while others wait until some months after that. Calling can continue until August or even later, depending on the species.

The call is produced in much the same manner as other animals produce sound—vocal chords vibrate as air passes over them. Unique to the frogs and toads, however, is the inflatable vocal sac possessed by most of them (See Figure III-8). There can be one or two vocal sacs, depending on species (See Figure III-9).

With the mouth closed, these amphibians draw air through the nostrils and into the lungs. The air then is forced from the lungs, and through openings usually located on the floor of the mouth, enters to inflate the sac(s). To emit its call, the frog or toad then pushes the air from the sac(s), forcing it over the larynx where the vocal chords are located. The sac is an effective resonator, like a sounding board on a

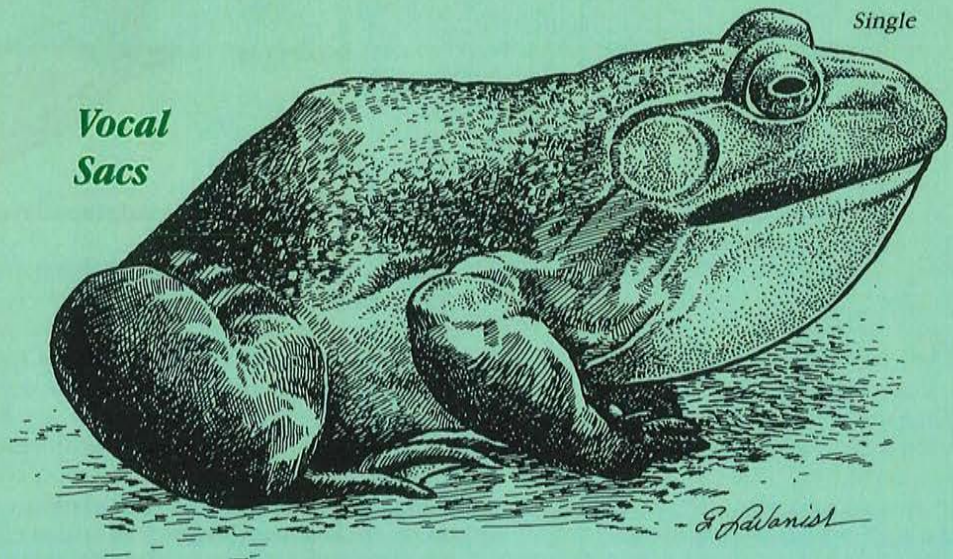


Figure III-9a

American Toad

Figure III-9b



stringed instrument. The sac itself, however, is not able to amplify the level of the call. As the air is expelled over the vocal chords and the call is completed, the sac deflates. It often is seen as an area of wrinkles or folded skin on the throat or shoulders of some species.

The calls produced by the various toads and frogs range from simple clicks to whistle- or bell-like sounds to a full, resonating deep croak. Each species has its own distinctive call. It is

recognized by the female of the species as the courtship ritual continues.

For the call to meet its intended purposes, frogs and toads have developed an effective hearing system similar to that found in humans. In most species, the external eardrum, called the tympanum, is easily seen. The tym-

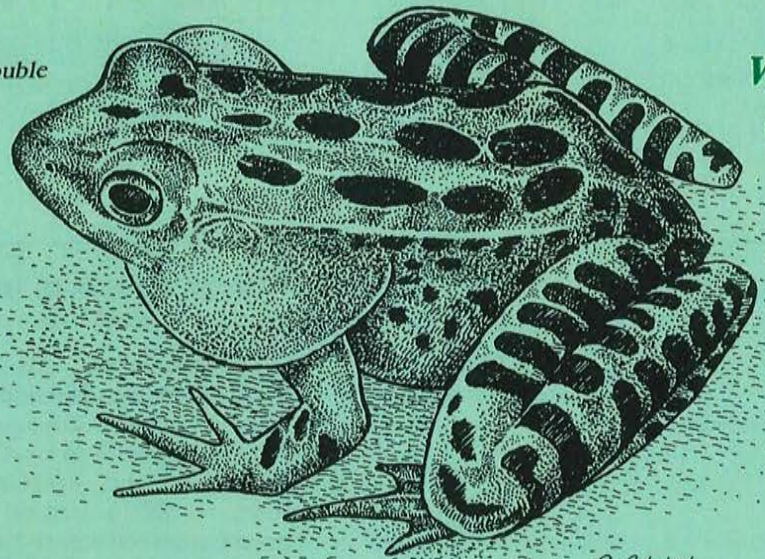


Figure III-10

The large, disk-like tympanum is easily detected on the bullfrog.

panum is protected by a thin layer of moist skin and is located behind the eye on each side of the head (See Figure III-10).

Double



Vocal Sacs

Leopard Frog

Figure III-9c

S. Savanist

Spadefoot (Family Pelobatidae)

Eastern spadefoot toad—*Scaphiopus holbrookii holbrookii*

Although there are seven members of this family residing in North America, only one occurs in Pennsylvania. Spadefoot toads can be separated from the true toads by the single, horny, dark and spade-shaped tubercle on the under surface of each hind foot (See Figure III-13). This sharp-edged tubercle usually is referred to as a spade, and it gives this family its common name. The spade is used effectively in digging rapidly into the soil. The pupils of their eyes are vertical (See Figure III-14), and they have teeth on their upper jaws. The skin of the spadefoots is not as rough or warty as that of the true toads.

Figure III-13

Feet

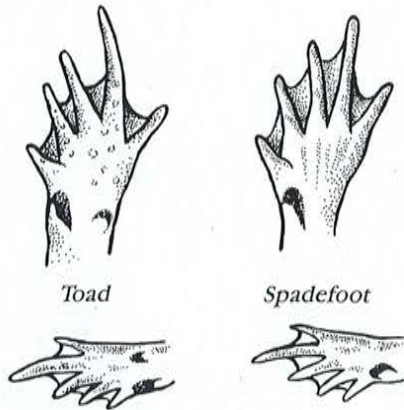
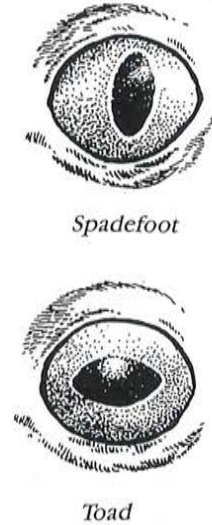


Figure III-14

Eyes



Toads (Family Bufonidae)

Eastern American toad—*Bufo americanus americanus*

Fowler's toad—*Bufo woodhousii fowleri*

This family of toads is commonly called garden toads because of their habit of invading neighborhood gardens in search of insects, a favorite food. The toads are squat and plump and covered with dry, rough skin, which usually is dotted with warts. The true toads have no teeth on the upper jaw. The pupils of their eyes are horizontal (See Figure III-14). Two tubercles are located on the underside of each hind foot. Cranial crests are prominent (See Figure III-11). Enlarged parotoid glands located on each side of the head just above the neck secrete a poison that can cause inflammation of the mouth and throat and even death to a would-be attacker. Only the hognose snake appears immune to these toxic secretions. Even humans can suffer severe irritation of the mucous membranes if they come in contact with these secretions.

Treefrogs (Family Hylidae)

Northern cricket frog—*Acris crepitans crepitans*

Northern spring peeper frog—*Pseudacris crucifer crucifer*

Eastern gray treefrog—*Hyla versicolor versicolor*

Mountain chorus frog—*Pseudacris brachyphona*

Upland chorus frog—*Pseudacris feriarum feriarum*

New Jersey chorus frog—*Pseudacris feriarum kalmi*

Western chorus frog—*Pseudacris triseriata*

The two small frogs of the genus *Hyla* spend most of their time in trees or small shrubs. The toes of these frogs expand on their undersides into sticky pads (See Figure III-6). These discs and their adhesive nature help these amphibians climb and perch in their arboreal homes. The male usually sings his pleasant song while clinging to a small shrub or bush standing in or overhanging the water. The other members of this family are more terrestrial and seldom climb trees or shrubs. Their toepads are less developed. Eggs are laid in the water.

In addition to the species illustrated and discussed in detail, two other closely-related members of this family occur in Pennsylvania. Upland chorus frog (*Pseudacris feriarum feriarum*) and the New Jersey chorus frog (*Pseudacris feriarum kalmi*)—The upland chorus frog has been found in southcentral Pennsylvania to as far north as Lycoming County. The New Jersey chorus frog has been reported only from southeastern Pennsylvania and is on Pennsylvania's List of Endangered Species. The area in which sighted helps identify these two subspecies and to separate them from the western chorus frog which they resemble. The New Jersey and upland chorus frogs are greenish gray to light brown or tan. Darker stripes divide the back. These stripes are more obvious on the New Jersey chorus frog than they are on the upland species, where they might be broken into rows of spots. The upper lip is outlined with a narrow, white band.

These small frogs can be found in a variety of habitats in grassy areas, either dry or wet, including swamps. Breeding occurs in shallow water from late winter to early summer. The average adult reaches three-fourths to 1½ inches in length. The call is similar to the western chorus frog.

True Frogs (Family Ranidae)

Bullfrog—*Rana catesbeiana*

Northern green frog—*Rana clamitans melanota*

Pickerel frog—*Rana palustris*

Northern leopard frog—*Rana pipiens*

Wood frog—*Rana sylvatica*

Coastal Plain leopard frog—*Rana utricularia*

These are the larger frogs, usually with a slim waist and long legs. The feet have pointed toes; extensive webbing connects the toes on the hind feet. Heavy folds of glandular skin, called dorsolateral folds, are located along the upper sides and can be an aid in separating certain species (See Figure III-7). The true frogs are voracious carnivores, consuming large

amounts of spiders, insects and other invertebrates as well as small vertebrates. If not in the water, they almost always are close to it where they quickly plunge in the event of danger.

In addition to the species that are illustrated and discussed in detail, one other frog, which is included in the state's original herpetofauna, but now is endangered, should be included. Coastal Plain leopard frog (*Rana utricularia*)—This member of the true frog family is only rarely encountered. Much of its habitat has been destroyed, and its populations have suffered as a result. It is included on the state's List of Endangered Species. The Coastal Plain leopard frog resides in fresh or brackish water and in summer ventures into fields and meadows to wander among moist vegetation. It has been sparsely recorded in its original range in extreme southeastern Pennsylvania. It is primarily nocturnal.

Reaching two inches to perhaps four inches in length, this frog looks similar to the northern leopard frog. The Coastal Plain leopard frog, however, has a whitish spot on the center of the eardrum, or tympanum, which the northern leopard frog does not have. Narrow dorsolateral ridges extend to the groin. The ridges are light-colored and are separated by dark spots. This leopard frog is greenish to brown over the back and sides. The legs are marked with dark spots or bars. The upper jaw is margined with a light line and the head is long and pointed.

Breeding occurs from March to June when the female seeks shallow water in which she lays up to 5,000 eggs. The eggs hatch about two weeks later and transform by summer.

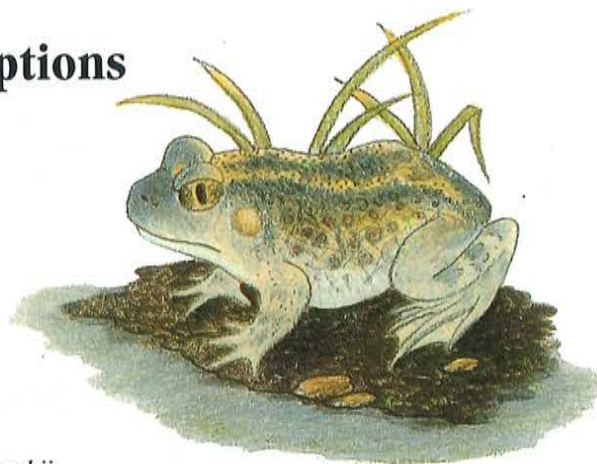
Species Descriptions

Eastern Spadefoot Toad

Scaphiopus holbrookii holbrookii

General characteristics. The eastern spadefoot toad is similar in appearance to the true toads. However, its skin is smooth and covered with minute tubercles, unlike true toads, which have rough, warty skin. It is the only spadefoot east of the Mississippi River. The adult size of the spadefoot is $1\frac{3}{4}$ to $2\frac{1}{4}$ inches, averaging a little less than the American and Fowler's toads.

The eastern spadefoot has a built-in repellent, as do all other amphibians, including toads. Skin secretions emitted from glands can cause irritation, especially to mucous membranes, even on humans. The secretions can be fatal to certain predators.

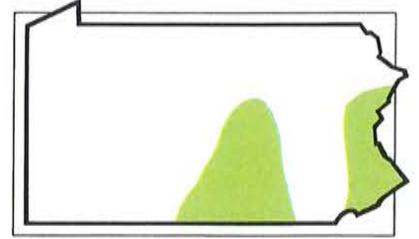


Identification. The primary key to identifying the eastern spadefoot toad is the hard sickle-shaped spade on each hind foot. This horny, sharp-edged tubercle can be found at the base of the shortest toe; there is only one spade. On the true toads, each foot has two enlarged tubercles, only one of which is sometimes hardened and spade-like (See Figure III-13). Also, unlike true toads, the spadefoot toad has teeth on the upper jaw.

The skin of the spadefoot toad is relatively smooth and covered on the back and sides with tiny, scattered tubercles. The body color can range through various shades of brown to yellowish or grayish to nearly black. The lighter shades frequently are mottled with darker pigments. There may be two light lines starting at the eye and continuing down the back. These lines, if present, are irregularly shaped and yellowish. Sometimes a light line also runs along each side of the body. The underside of the eastern spadefoot is white to grayish and unmarked.

The tympanum, or external eardrum, is distinct and obvious. The parotoid glands, on the other hand, are inconspicuous and appear to be absent. The eyes are prominent, elevated well above the upper surface of the head; the iris is golden. The pupil is black and vertically shaped, not horizontal as in the case of the toads.

Range. In Pennsylvania, the eastern spadefoot toad resides in a split range. Populations are found in southcentral Pennsylvania in the Susquehanna River Valley from the Maryland border to the northcentral part of the state. The range becomes more narrow as it moves northward. The spadefoot also occurs along the extreme eastern edge of the state, beginning in the southeast corner where it follows the Delaware River Valley north to Monroe County. Its range extends into parts of New England and as far south as central Florida. Its western boundary is Missouri.



Habitat. The eastern spadefoot toad especially likes sand, gravel or loose loam into which it can quickly burrow for protection. In the eastern United States, this species may be at home in forested or brushy areas, even cultivated land. However, other species of the spadefoot in more arid areas of this country usually are restricted to the preferred sandy soils more common to those areas.

The spadefoot seeks protection from adverse weather and predators by digging furiously into the loose soil. Using a backward digging movement and the spade on its hind legs as a digging tool, the spadefoot can be inches underground in a very short time. The burrow is dug nearly vertically five to 10 inches deep. The spadefoot can spend weeks, even months, underground, coming out only on warm, damp evenings to survey its surroundings or seek a meal. If it has time only to dig a very shallow hole, or if it wants to sit near the mouth of a deeper burrow, the spadefoot is able to assume a position that fills the opening. Facing outward, the spadefoot rests its chin on the front feet with the head bent downward. Tucking its feet in close and with eyes shut, the spadefoot expands its lungs to cause its sides to puff out, filling the passageway. Under these circumstances, the spadefoot is difficult to detect or grab, and closing off the entrance, it prevents any intruder from getting in behind.

Reproduction. The eastern spadefoot toad normally is a spring breeder, but mating can occur as late as September. Calling starts from the time the spadefoot leaves hibernation in March, and the female responds to the male's song after a torrential rain; actual breeding has to wait until sufficient rainfall creates a temporary pool. Most of the breeding takes place in such pools, rather than in permanent ponds or streams. Temporary pools can be rain-filled depressions in the ground, ditches or impermanent marshes.

The spadefoot toad is an explosive and opportunistic breeder. Females are attracted to the male who has been calling from a rain-created pool. The male grasps the female around the waist and fertilizes the eggs as they are laid. The eggs are deposited in short strings of gelatinous bands and are attached to vegetation standing in the water. She lays about 2,000 eggs, a number considered unusually low for an amphibian using temporary pools for breeding. Thus, survival of the eggs and tadpoles is critical and could affect the population of the species in a particular area.

The process of egg development and transformation into a young spadefoot toad must be completed before the pool of water dries up. This accelerated cycle sometimes can be completed in as little as two weeks. Normally, the eggs hatch in two short days with transformation occurring several weeks later. The tadpoles are dark in color with a narrow spotted tail. The tadpole leaves the water as transformation begins and while the tail is still quite long. If it did not, the larva could drown because it would not be able to move about properly with the added weight and length of the tail.

Call. The eastern spadefoot toad may begin calling from the burrow even before it has completely vacated its winter home. Later, as rainfall fills nearby ditches and other low areas, the male spadefoot begins to call from the surface of the water. The song is a coarse, nasal, low-pitched grunt that seems to burst from the vocal sac. The call is short, but repeated at about two-second intervals. It has been described as sounding like the cry of a young crow. It carries well, up to a half-mile. The throat sac where the call originates is a white bubble three times the size of the head when inflated.

Food. Normally, the spadefoot toad does not venture far from its burrow in search of food. Flies, other insects and spiders are the mainstay of its diet.



Eastern American Toad

Bufo americanus americanus

General characteristics. The eastern American toad, closely related to Fowler's toad, is more widely distributed in Pennsylvania. It can be confused with Fowler's toad, although there are several characteristics separat-

ing the two. They are noted here and in the description of Fowler's toad. Average adult size of the eastern American toad is two to 3½ inches, about the same as Fowler's.

The eastern American toad, however, can tolerate colder temperatures and thus goes into hibernation a bit later than Fowler's and emerges a few weeks earlier in the spring. The eastern American toad is primarily nocturnal and spends most of its day sheltered among piles of leaves or burrowed under loose rocks. So even though it is an abundant toad throughout most of its range, its nighttime habits prevent it from being seen very often.

This is the common "hoptoad," so-called because of its "hopping" in moving from one area to another, rather than "leaping," as frogs do. Characteristic of other toads, toxic secretions from skin glands can irritate mucous membranes. People do not, however, get skin warts from this or any other toad.

Identification. Various patterns or patches in light colors, usually buff or yellowish, mark the eastern American toad. These patterns occur over a background color that usually is brown, but that also can be olive to brick red. In some specimens, a light stripe runs down the center of the back. The forward part of the belly, or abdomen, and the chest are spotted, compared to the plain underparts on Fowler's toad. Dark spots in brown or black range over the back. Each of these larger spots contains only one or two warts; Fowler's has three warts in each. These warts are red, yellow, orange or sometimes dark brown. The warts on each thigh are enlarged, bigger than on Fowler's toad. The parotoid gland (located behind the eye) is more kidney-shaped than the elongated gland of the Fowler's toad (See Figure III-15). On the eastern American toad, this gland does not touch the cranial crest (a bony ridge) behind the eye, or if it does, it is connected only with a slight spur. On the other hand, the gland on Fowler's toad comes in direct and full contact with this crest (See Figure III-12).

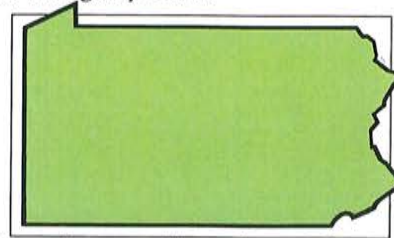
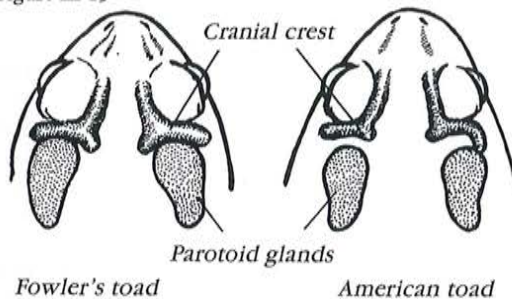
The eyes of the eastern American toad are elevated

well above the head. The pupils are horizontally shaped and black; the iris is golden on this toad, compared to Fowler's bright yellow.

Range. Distributed statewide in Pennsylvania, the eastern American toad is a wide-ranging amphibian residing east of the Rocky Mountains. It is found from the warm climes of Louisiana to the cold of the Labrador Peninsula in Canada.

Habitat. This amphibian has adapted to a variety of habitats and can be found in populated areas to remote wilderness regions, from well-manicured lawns to grassy fields and heavily forested, often rocky mountains. It has two requisites for suitable habitat over most anything else: The area must be moist and include an area of shallow water for breeding, and the area must have an abundance of insects. It is often seen foraging over plowed fields

Figure III-15



where a variety of invertebrates has been disturbed as the land is prepared for agriculture. It is a friend of farmers and gardeners alike. The eastern American toad, though more tolerant of colder temperatures than Fowler's, seeks protection from the winter before the first frost hits. It hibernates in the ground where it burrows into loose soil.

Reproduction. The eastern American emerges from hibernation and breeds before Fowler's toad, but after the common frogs such as the leopard, pickerel frog and wood frog. Mating occurs from March until July. Shallow water is required for breeding, even if it is only a temporarily filled ditch or rain pool. If a stream is selected, a slower-moving section or pool provides suitable breeding habitat.

The male arrives first at the breeding pond or pool. Emerging from hibernation in the spring, he travels at night to reach the water. Here, from the shallows, the male American toad begins to call his mate. Eggs are released and fertilized as the male and female toads float together on the surface of the water. The eggs are small and may number from 4,000 to 20,000. They are released in long, curling strings, usually a double strand encased in a protective jelly-like tube. They may stick to vegetation, or sometimes simply float downward until they rest on the bottom.

Depending on the temperature of the water, the eggs hatch in as little as three days or up to nearly two weeks. Breaking free of the small eggs, the black tadpoles begin to breathe using gills which at first are located externally. As the tadpoles develop, however, these gills become encased in a flap of skin. They remain in this larval stage a little less than two months, metamorphosing in mid-summer. During transformation, the back legs appear first, then 10 to 14 days later the front legs suddenly appear. After transformation is completed the young toadlets disperse immediately. The eastern American toad is mature in two or three years.

Call. The males begin calling their mates in early spring, usually about March. The singing is performed night and day. Calling from shallow water, many male American toads join in chorus, sending their song in unison through the early season air. It is a pleasant voice, the call a musical trill lasting up to 30 seconds. When calling, air is pulled through the mouth and into the throat sac, expanding it to a size nearly equal to the head. The inflated sac is a light shade of blue-gray.

Food. The eastern American toad consumes a huge number of insects, mosquitos included. Said to eat all sorts of "bugs," this amphibian is a real friend to the backyard gardener. Other invertebrates, worms and caterpillars are also taken as prey. This toad is adept at catching insects, aided by its sticky tongue. Fastened at the front, rather than the rear, the tongue can be flipped out and extended two inches from the mouth.



Fowler's Toad

Bufo woodhousii fowleri

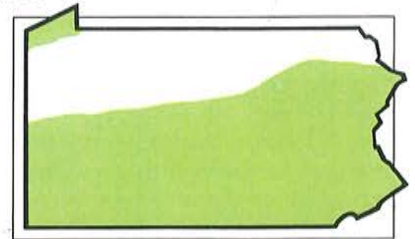
General characteristics. One of only two true toads in Pennsylvania, Fowler's toad is abundant throughout most of its range. It does most of its foraging at night, preferring to rest during the day when it burrows into the ground or hides among clumps of grasses. It is more slender and more agile than our other toad, the eastern American, but it cannot tolerate temperatures as low as the American toad can withstand. As an adult, Fowler's toad averages two to three inches in length, nearly identical to the eastern American toad.

Identification. The skin of Fowler's toad is dry, a common trait among toads. Its general coloration is brown or gray with an occasional greenish specimen showing up in the population. A light, nearly white stripe runs down the middle of the back. Large dark spots or blotches, more or less arranged in pairs, cover the back. Each of the largest spots contains at least three warts. On the underside of this toad, the belly is white and unmarked, although a dark spot sometimes is found on the chest. Warts cover the thighs, but they are small compared to those found on the eastern American toad.

The parotoid, or shoulder, glands are elongated (compared to kidney-shaped ones on the American toad). They come in contact with the cranial crests just behind each eye (See Figure III-12). The throat of the male is black; the female's throat is a very light shade. The underside of each hind foot of the Fowler's toad bears two tubercles. These tubercles should not be confused with the single, stiff spade protruding from each hind foot of the spadefoot toad (See Figure III-13). The eyes of the Fowler's toad have horizontally oval pupils with bright yellow irises.

Range. Except for populations in the Lake Erie Watershed in the northwest, Fowler's toad in Pennsylvania is restricted to the southern two-thirds of the state. From there it extends along the Atlantic Coastal Plain to North Carolina and westward to Missouri.

Habitat. Fowler's toad likes low-lying areas, especially where it can find sandy soils along the water. But marshes and even slight depressions temporarily filled with rainwater are accepted by Fowler's toad as suitable—though perhaps not permanent—habitat. It frequently forages among landscaped flower or vegetable gardens usually at night. It spends most of the day burrowed beneath the ground.



Reproduction. Male and female Fowler's toads meet sometime from late March to mid-August. Fowler's toad waits for temperatures to warm up a bit, coming out of hibernation later than the American toad. The peak breeding activity probably occurs in May and takes place in shallow standing or slightly moving water. The eggs, which number many thousands, are laid in long, tangled strings. They become attached to vegetation growing in the shallows. This vegetation eventually provides shelter for the tadpoles. Incubation takes only about a week, perhaps a few days longer depending on the water temperature. The tadpoles are black and transform into young toads by mid-summer.

Call. The male Fowler's toad begins calling in late March as he prepares to find a mate. Calling usually is done from shallow water, though sometimes he'll leave the water to sing from the shoreline. The call has been described as sounding like a weakened bleat of sheep. Lasting from one to four seconds, it has good carrying power and can be heard over a wide area. The throat sac is round when inflated; it is light-colored and transparent.

Food. A nocturnal critter, Fowler's toad usually has no problem finding an ample supply of insects, a favorite food source. It takes advantage of lighted areas, knowing, it seems, that lights attract insects, thus making foraging for a meal a simpler task.



Northern Cricket Frog

Acris crepitans crepitans

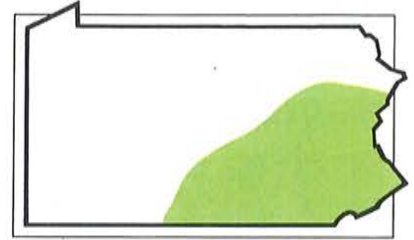
General characteristics. You may have to look twice to see the northern cricket frog. Its coloration and small size allows this tiny amphibian to conceal itself easily, so it often is difficult to find even if nearby. As an adult, it averages only five-eighths to $1\frac{3}{8}$ inches long.

It is diurnal and when not basking in the sun, spends the rest of its day foraging for food. Although a member of the treefrog family, the northern cricket frog is destined to spend most of its time on the ground because this species has lost the large, adhesive toe pads typical of the treefrogs.

Identification. The skin of the northern cricket frog is rough and warty. The ground color is usually gray accented with darker stripes that run down each side of the back. The dark triangular patch located between the eyes is a major identifying mark.

A dark stripe, usually with an irregular edge, runs along the rear portion of the thigh and also helps identify this species. The legs of the northern cricket frog are short with extensive webbing on the hind feet. The webbing reaches the tip of the first toe and this, along with the absence of toe discs, also can help sort this frog from other treefrogs and chorus frogs. The head is slightly rounded, almost blunt; the pupils of the eyes are horizontal.

Range. The northern cricket frog occupies a little less than a quarter of the state. Found in the southeast corner, its range falls within an arc beginning in Franklin County, then curving north and east to the southern edge of the Pocono Mountains. It is distributed from Long Island south to the Florida panhandle, then west to just inside Texas.



Habitat. Considered more terrestrial than most aquatic frogs, the cricket frog is content to hop among the sedges and grasses at the water's edge. When it feels the need to return to the water, the northern cricket frog prefers shallow, sun-drenched ponds punctuated with a substantial growth of vegetation in and along the water. It also can be found near slow-moving streams, often squatting on sandbars or banks of gravel where it warms itself in the glow of midday. It seeks shelter from extreme cold under stones and piles of fallen leaves.

When frightened, the northern cricket frog quickly dives beneath the surface of the water where it promptly buries itself in the bottom mud.

Reproduction. Although mating might occur anytime between April and August, the northern cricket frog generally is considered to be a late breeder. Mating is accomplished when the male clasps the female just behind the forelegs as they float in the water. Two to 10 eggs are deposited singly or in small masses that become attached to submerged grasses, stems and leaves. Tadpoles may be seen as late as August and transformation follows in September.

Call. In its northern range, the northern cricket frog is one of the last frogs to begin calling in full chorus. As the male sings, a single yellow throat pouch inflates and becomes the source of a shrill clicking sound, similar to a cricket. The call starts slowly, picks up speed and does not stop until 20 or 30 individual beats or clicks have been pushed out of the pouch. The sound has been described as two small stones rapidly clicked together. Singing often is done in full view with the male perched contentedly on the leaf of a water lily or other broad-leaved aquatic plant.

Food. The northern cricket frog capitalizes on its ability to leap in long bounds when foraging for a meal. Insects are the mainstay of the diet, and much of the prey taken by this amphibian is caught "on the fly"—its knack for catching insects in mid-air helps ensure an adequate supply of food.



Northern Spring Peeper

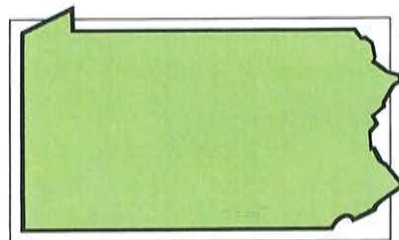
Hyla crucifer crucifer

General characteristics. One of the state's tree-climbing frogs, the northern spring peeper belongs to the family Hylidae, as do all the tree dwellers. The northern spring peeper is seldom seen except during the breeding season, even though it is perhaps our most abundant treefrog. Nonetheless, its habitual and easily recognized call makes this small woodland amphibian one of our most familiar frogs. It averages in length from three-fourths to 1¹/₄ inches as an adult.

Identification. The most recognizable feature identifying the northern spring peeper is the large, dark, irregularly X-shaped mark in the middle of the back. A dark, modified Vee appears between the eyes, and the legs are barred with a dark color. The slender body is tan to light brown or grayish on the upper surface; the belly is light, becoming yellowish toward the rear but otherwise is unmarked.

The feet are moderately webbed and end in toes with the large, sticky pads characteristic of treefrogs.

Range. Most of the eastern one-third of the United States has resident populations of this amphibian. It also extends into Canada and as far west as Manitoba. Each of the state's counties has populations of the northern spring peeper, available to signal the start of the spring season.



Habitat. The peeper seems to have no problem finding suitable habitat, which usually is a wooded area near a permanent body of water. Even temporarily flooded swamp areas, floodplains or ponds are acceptable habitat, although the water must be clean; the northern spring peeper avoids polluted water. It especially likes wooded areas with a full, jumbled understory. As winter approaches, the northern spring peeper prepares to hibernate beneath logs or loose bark in the woodlands where it has spent the spring and summer months. The males call only sporadically at this time.

Reproduction. The northern spring peeper is among the first frogs to leave the protection of its winter home and prepare for breeding. The high-pitched calls, which signal the start of the breeding season, can be heard in March as the air temperatures approach the mid-50s, and reach a peak when temperatures warm up another 10 degrees or so.

Courtship occurs March to June, usually initiated with the first warm rains. When the temperature is right, the peepers begin their migration to

nearby ponds or semi-permanent bodies of water where the female approaches to be grasped by the male. The female releases the eggs, which are fertilized by the male as they float away. The singular eggs become attached to plants, sticks and other underwater debris. Occasionally they may drift downward and settle on the bottom of the pond. As many as 1,000 eggs may be laid. They are tiny, black on top and white on the lower side.

The eggs expand and tadpoles break free in six to 12 days, depending on the temperature of the water. Metamorphosis follows in 90 to 100 days and the young froglets may climb onto nearby grasses even before the transformation process is completed. Inasmuch as breeding takes place early in the season, the juvenile frogs may have transformed completely as early as mid-summer.

Call. A chorus of northern spring peepers is a familiar and most pleasing sound. It is welcomed as one of the first signs of spring, stirring life to a fresh start and brightening the listener's mood after the drab and dreary days of winter. Calling begins with the early warm rains and initially is heard day and night. The daytime serenading often comes from under cover, or perhaps with the peeper perched atop the mottled new tops of a skunk cabbage. Later, as the season wears on, vocalizing is limited to late afternoons and at night. Singing normally is done in groups, with choirs of peepers singing from their lofts in small trees or shrubs. The host trees and other bushes usually are in or near the water of a deep forest pond, small pool or even marshland.

The call of the northern spring peeper has been described as a high piping whistle, a single note ending with an upward slur. The single tones come at about one-second intervals. A large chorus of peepers heard from a distance is reminiscent of a series of leather-strapped sleigh bells jogging down a quiet country lane. The peeper's vocal sac is a single glistening throat bubble.

Food. Not a very large amphibian, the northern spring peeper feeds on small invertebrates. Flies, gnats, ants and small worms and grubs provide proper nourishment for this interesting amphibian.

Eastern Gray Treefrog

Hyla versicolor versicolor



General characteristics. As treefrogs go, the eastern gray treefrog is a moderately large animal, measuring 1 $\frac{1}{4}$ to two inches along its body. It is nocturnal and spends the day reposing beneath the loose bark or in the hollow of a tree. At other times it simply clings to the trunk or branch of a tree, where its color and pattern create a natural camouflage, blending in with the bark and concealing it from all but the keenest observer (See Figure III-16).

Identification. The eastern gray treefrog is greenish to brownish or, perhaps more often, grayish. The back is marked down the center with an irregularly outlined blotch; it stands out dark and large. The thighs of the hind legs are a bright yellow-orange on their insides and undersides, areas usually concealed from view. A light spot, edged in a darker color, appears below each eye. The eyes have shiny black pupils with gray-green irises criss-crossed by a network of fine black lines.

The eastern gray treefrog has a blunt snout resembling a toad, but it has the narrow waist and long legs of a frog. Its toes end in large pads or discs. These discs are adhesive on their lower surfaces to aid in climbing. The skin of the eastern gray treefrog is rough and the back is covered with numerous warts, although they are not as prominent as those on toads.

Range. The eastern gray treefrog is believed to be distributed statewide in Pennsylvania, missing perhaps from the Allegheny Mountains where documented sightings are sketchy at best. Except for northern Maine and southern Florida, this treefrog extends over the eastern one-third

or better of the United States. Its western limit is generally marked with a line running from Manitoba in Canada to central Texas.

Habitat. The eastern gray treefrog spends most of its time in the upper reaches of trees, coming down to ground level only at night to call and to breed. It seems to prefer smaller varieties of trees or shrubs and especially likes those standing near or even in shallow, permanent bodies of water. It is an adaptable creature, because it is sometimes found in populated areas and around homes.

Reproduction. In the spring, as nighttime temperatures begin to warm, the eastern gray treefrog carefully climbs from his perch to join others in chorus, signaling the start of the annual mating season. This is about the only time the eastern gray treefrog is seen on the ground. Mating occurs between April and August, with the later months probably the time when most treefrogs enter the water. The eggs are fertilized by the male as the female releases them. The female may lay 700 to 3,800 eggs, usually in small, floating groups or light-jellied masses of up to 40 eggs each. The brown and cream-colored eggs hatch in a few days. The tadpoles that emerge from the eggs are a golden color with a red to orange-red tail. The tail is marked with black spots. The tadpoles transform in summer, usually in six to eight weeks. The young frogs, greenish at this stage, are about a half-inch long. They stay close to the water, but by the end of the summer they have advanced to nearby small trees and bushes.

Call. The eastern gray treefrog usually begins calling high in the trees and away from the breeding site. Later, as it moves down it calls at ground level, resting on wet leaves or on fallen logs or low tree limbs that overhang the water. The call of the eastern gray treefrog has been described as almost

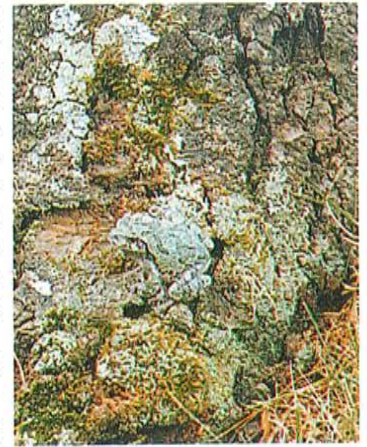
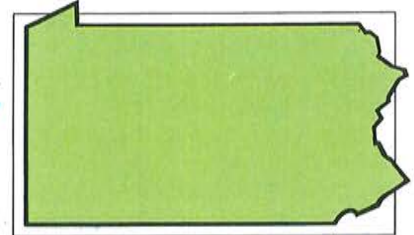


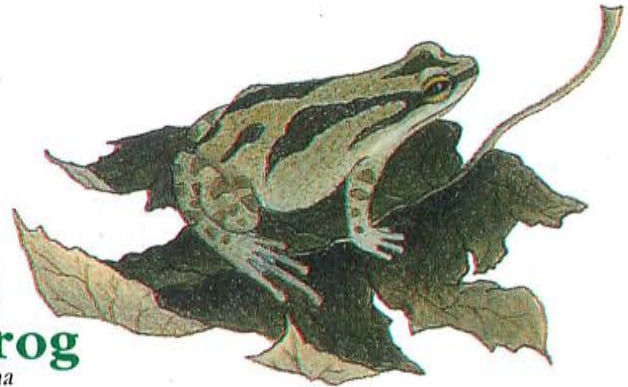
Figure III-16

Can you spot the eastern gray treefrog effectively concealed against a tree?



flute-like, but at a lower pitch than the American toad. It is a hearty, resonating short trill of one to three seconds, performed several times in succession. The call comes from a single throat sac, a large inflated bubble. This frog calls mostly during spring and early summer at dusk or on rainy days.

Food. A variety of insects such as beetles, flies, ants and so forth fulfill most of this amphibian's need for food. The eastern gray treefrog does not stalk its prey in the manner of most toads. Its prey is taken in trees located near or in the water where it swats down an unsuspecting victim as it passes by.



Mountain Chorus Frog

Pseudacris brachyphona

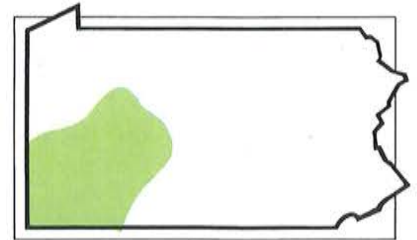
General characteristics. This member of the treefrog family is nocturnal. Though it is often heard, it is seldom seen, especially after the breeding season. In moving about, it leaps better than it walks. Adult sizes range from one to 1¼ inches in length.

Identification. The small mountain chorus frog is light brown to green with some overtones of gray. The belly and undersides of the legs are yellowish. A key mark in identifying the mountain chorus frog is the pair of dark stripes on the back. These two stripes run lengthwise and curve inward and toward each other. The effect is two crescent-shaped marks that sometimes touch each other near their centers to form a crude "X."

A dark, broad, lateral stripe traverses each eye, beginning near the tip of the snout and ending a short distance behind the eye. The area on top of the head between the eyes is accented with a dark, modified triangle. The upper lip is margined with a white line. The toes are slightly webbed and have small, round tips that are miniaturized discs compared to other treefrogs. The smaller discs, or pads, prohibit this amphibian from reaching heights equal to the peeper or eastern gray treefrog.

Range. Pennsylvania marks the northernmost extremity of the mountain chorus frog's range. It resides from here through southeast Ohio and into central Alabama. It ranges west of the Allegheny Mountains in counties in the southwestern corner of the state.

Habitat. It prefers forested areas, often mountainous country where creeks and small brooks bubble down wooded slopes. However, it is not unusual to find mountain chorus frogs far from water.



Reproduction. The mountain chorus frog is an early breeder, beginning as soon as February but extending until April. A single female responding to a chorus of numerous males finds her mate near or in the water. Breeding takes place in the shallows of a remote woodland pond or in water near the edge of a forest. Even ditches temporarily filled with water, or water collected as it springs from the side of a hill, could serve as breeding grounds. Released by the female, the eggs are fertilized by the male before they become attached to grasses and other vegetation. The eggs hatch in a few days, the tadpoles squirming free to swim among the stalks and stems that harbored the eggs.

Call. The mountain chorus frog begins its song in response to the first warm rains of early spring. It is among the first frogs to beckon a mate as it sings day and night from a perch near or in shallow water. The mountain chorus frog vocalizes while concealed among leaf litter and grasses along the water's edge. The call is a high-pitched, raspy squeak, performed in a rapid series. The male has a single rounded vocal sac.

Food. The mountain chorus frog, although a member of the treefrog family, forages mostly on or near the ground. Insects are taken from weeds or low shrubs.

Western Chorus Frog

Pseudacris triseriata

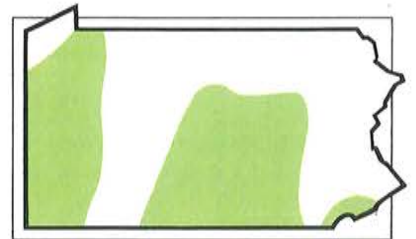


General characteristics. The western chorus frog is one of two chorus frogs of the genus *Pseudacris* that resides in Pennsylvania. The western chorus frog averages three-fourths to 1½ inches in length.

This treefrog becomes most active late in the day as the sun sets. As a nocturnal creature, it usually is difficult to observe and becomes even more so past the breeding season when it spends most of its time in hiding.

Identification. The smooth skin of the western chorus frog can be greenish gray to light brown or tan. The belly is off-white and usually plain, showing a lack of any markings. Three stripes, a gray or brown darker than the body color, divide the back. Another dark stripe begins on each side near the nostril, runs backward through the eye, along the side, and ends near the groin. A narrow, white band outlines the upper lip.

Range. In Pennsylvania the western chorus frog is restricted to the area west of the Allegheny Mountains. It appears in the counties situated between the mountain ridges and the Ohio state line.



Habitat. The chorus frog adapts to a variety of habitats that include grassy areas in terrain that can be either dry or wet, including swampland. It can even find agricultural land quite hospitable and conducive to meeting the needs of a thriving population. After the breeding season, and during the winter months, the chorus frog finds shelter under large stones, deep in tufts of grass and within the deserted tunnels of burrowing animals.

Reproduction. The chorus frog breeds from late winter to early summer, usually February until June. The male fertilizes the eggs as the female releases them in shallow water. Usually laid in groups or masses of up to several hundred eggs each, the egg masses become attached to submerged plants. As many as 1,500 eggs may be laid and they take up to seven days to hatch. The larvae remain in the tadpole stage for six to eight weeks before transforming into young frogs.

Call. It is not unusual to hear the male western chorus frog call even before all the ice has melted from what eventually will become his breeding pond. The call is a raspy trill, rising in pitch toward the end. Described as a vibrant *prrrreep*, it lasts from one to two seconds and is repeated several times in succession. The chorus frog calls from near the water or while sitting upright in vegetation at the surface of the water. At the slightest threat, however, this amphibian retreats quickly, disappearing to safety beneath the water.

Food. Moving about carefully at night, the western chorus frog searches for small insects and their larvae. Small invertebrates are the primary staple of this amphibian.



Bullfrog

Rana catesbeiana

General characteristics. The bullfrog is a large aquatic frog. It, or at least its call, is familiar to anyone who has ever been near a large body of water during the evening or early morning hours in the summer. It is a solitary

creature, more so than any of our other frogs, and does not engage in chorus singing even during the breeding season. In fact, the mating season may be the only time the bullfrog is prone to socialize at all, and then only with its mate. A bullfrog jealously guards its territory. Other males are aggressively kept from its calling site.

Adult sizes range from 3½ to six inches. It is not the longest jumper. That record goes to the leopard frog, which may outjump a bullfrog by as much as 10 inches, hitting the three-foot mark. However, the bullfrog is a powerful swimmer with long, strong hind legs. The bullfrog uses these powerful appendages to push rapidly through the water. When swimming underwater, the bullfrog is able to lower its eyes to a level even with the head by pulling the eye sockets into the roof of the mouth. Thus protected, the eyes also are closed so that the frog can swim only short distances before having to stop, or at least slow down, to view the surroundings before moving on again at a rapid speed.

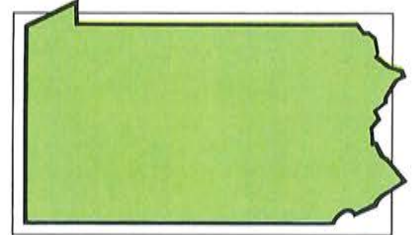
When under water, the entire surface of the skin acts as a large gill, allowing the frog to breathe. The nostrils and lungs are not required when submerged, and the frog can remain under water for months at a time during hibernation.

The legs of the bullfrog are considered a culinary delight by many people. In Pennsylvania, this amphibian is regulated by seasons and bag limits. Check your *Summary of Fishing Regulations and Laws* for details.

Identification. The body of the bullfrog is broad and full. In a crouched position, the body is nearly parallel to the ground, rather than in the more-or-less upright position assumed by most other frogs. The head is broad and flat with large, protruding—almost bulbous—eyes. There is no outer ear as we know it in most mammals, which is typical of the frogs and toads. However, the external eardrum is present and is flush with the surface of the head; on the male adult bullfrog, the diameter of the eardrum is larger than the eye. In the bullfrog the folds of skin, referred to as dorsolateral ridges, begin at the eye, run around the eardrum and down to the forelegs. Its legs are long and well-muscled, suited to providing powerful swimming strokes. Except for the last joint of the longest (fourth) toe, the hind feet are fully webbed, which also aid its underwater mobility.

The bullfrog is green to yellowish above with a random mottling of dark gray. The belly is cream to white and also may be mottled with gray. The throat of the male, especially, may have a mottling of gray or yellow. The legs are often spotted or marked with dark bars.

Range. The bullfrog is a statewide resident with populations in many of Pennsylvania's rivers and streams and hundreds of lakes and ponds. At one time, the Pennsylvania Fish and Boat Commission raised and planted bullfrogs throughout the state, and this may account, in part at least, for the bullfrog's widespread distribution. Outside of Pennsylvania it ranges from Nova Scotia to the Rocky Mountains.



Habitat. The bullfrog prefers lakes and ponds (nearly every farm pond has some bullfrogs) and slow-moving water as long as there is sufficient vegetation to afford it proper cover. It likes large waters in which many of our other frogs might not “feel” comfortable.

The bullfrog is aquatic, though it often sits, sometimes warily, other times contentedly, among the grasses lining the water’s edge. If frightened, it could flee with a giant leap into the safety of the water. Still, it is not apt to strike out on land on an extended excursion.

As autumn turns to winter and temperatures continue to fall, the bullfrog enters the water one last time, swims to the bottom and burrows into the soft mud. Here it hibernates until spring when the water again warms.

Reproduction. Emerging late from hibernation, the bullfrog breeds after many other amphibians have already performed this annual ritual. May to at least July arrives before the male actively begins to call a mate. By now air temperatures are in the 80s and water temperatures have climbed into the 70s. These higher readings apparently trigger the breeding instinct. The male, aggressive and territorial, vigorously defends his calling site, and later, his breeding site.

The tiny eggs released by the female may number as many as 40,000; the eggs are fertilized by the male as they exit the female and float upward spreading into a large mass on the surface of the water. Unlike the egg masses deposited by some of our aquatic amphibians, the egg masses of the bullfrog are not encased in a cohesive layer of protective jelly. Thus free, the mass may cover an area on the surface of the water of one to two square feet or more. This mass usually spreads among surface vegetation to which it may adhere.

Hatching takes four to five days and the new tadpoles look like the tadpoles of the green frog. The tadpoles are olive-green and large, perhaps four to six inches by the time they transform into young bullfrogs. Metamorphosis from tadpole to frog could take up to two years in the case of the bullfrog. By then it may already be a three-inch frog, but won’t reach full adult size for another two or three years.

Call. The bullfrog has an internal vocal sac that inflated looks like a flattened pouch beneath the chin. It does not have the bubble-like appearance formed by the external sac common to the peeper or chorus frogs. The sac is an effective resonator. Air is taken in through the nostrils and enters the sac through an opening in the bottom surface, or floor, of the mouth. When the call is made, the air is pushed out of the sac and passes over the vocal chords located in the throat.

The deep, resounding series of low notes that result often can be heard up to a quarter-mile away or even farther on a quiet morning. Sung at irregular intervals, the reverberant song usually is described as sounding like a gravel-voiced basso repeating the theme *jug-o'-rum . . . jug-o'-rum*. It is a familiar sound, riding the night air away from the water’s edge in May or June to as late as August. The bullfrog normally does not sing in chorus with other bullfrogs. Given its solitary habit, it is a lone singer, although with several individuals residing on the same water it may seem as if they were conversing with one another.

Food. The diet of the bullfrog is more varied than most other frogs, and almost any moving object is a potential meal, including other smaller bullfrogs. Crayfish seem to be favorites, but insects, other frogs, small fish, bats,

birds, snakes and even turtles contribute to making a bullfrog's dinner menu quite different from that of many other amphibians.



Northern Green Frog

Rana clamitans melanota

General characteristics. This abundant frog is primarily nocturnal. That is, it is most active at night, but moves about and forages a bit during the day as well. Along with the bullfrog, it is more aquatic than many frogs. It is a medium-sized frog, slightly smaller, but otherwise similar in appearance to the bullfrog. Adult average sizes range from 2¼ to 3½ inches. The northern green frog is more gregarious than the bullfrog, but it still maintains a more aloof attitude than some other frogs, living mostly a solitary lifestyle. It is not as wary as many other frogs, although when basking in the sun it sits alert, facing the water. This posture provides a quick escape into the water if danger threatens. A quick dive and it soon is lost among the bottom detritus, or gravel.

The green frog may molt four or more times a year, in or out of the water. If the outer covering is shed while the green frog is in the water, the skin simply floats away, carried by the wind or current. If the molting process takes place on land, the old skin may be eaten by the green frog, a practice also common to the leopard frog and American toad.

In Pennsylvania, the green frog is protected by seasons and bag limits identical to those protecting the bullfrog.

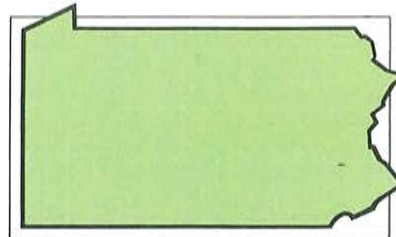
Identification. The green frog appears in an assortment of colors and patterns. It may be a brilliant metallic green, or vary from greenish brown, or brownish to tan. Dark-brown or gray spots, some large enough to be called blotches, appear on the back, frequently in large numbers. The head and upper lip are green, which is especially noticeable in the adult male. A yellowish band runs along the jaw to the shoulders. The belly is white with dark lines or spots under the legs. The throat of the male is yellow, often brilliantly colored; the throat of the female is white with dark spots. Close examination of the eyes reveals a black, oval pupil with a gold iris.

The forward part of the head ends in a blunted point. The external eardrum is large, and on the male, bigger in diameter than the eye. The tympanum is flat, brown and covered with a thin, moist layer of skin.

Folds of skin, called dorsolateral ridges, help separate the green frog from the bullfrog. In the green frog, these folds extend from above the eardrum along the back; in the bullfrog they do not. Unlike many frogs, however,

the folds on the green frog do not extend all the way back to the groin, but stop about midway along each side.

Range. The green frog is distributed statewide and is found in all Pennsylvania counties, many with abundant populations. Outside of the state, its range extends from the Maritime Provinces of Canada south to North Carolina. It goes west to Minnesota and Oklahoma.



Habitat. The green frog stays close to shallow water. Although this frog is thought of typically as a frog of brooks and small streams, it also resides in most types of ponds, or in swamps and springs. Fallen logs, with their moist, decaying matter, provide shelter to the green frog. The green frog may remain active through 12 months of the year if the winters are not too severely cold. In the event winter does force it to seek refuge, the mud or moss of a pond or other shallow water offers sufficient protection.

Reproduction. As winter's cold temperatures give way to the warming rays of the spring sun, female green frogs respond to the calling males and "select" a mate. Mating takes place in the water, and the males especially like an area thick with aquatic plants.

The actual breeding ritual, in which the male grasps the female in amplexus, can occur from as early as May to as late as August. The eggs appear in three or four clutches and are fertilized by the male as the female releases each mass. The small masses produce a combined total of 1,500 to 4,000 eggs. Each spherical egg is black on the upper side and white beneath. Once they have passed close to the male, each clutch becomes attached to vegetation at or just below the surface of the water.

The eggs hatch within a few days depending on the temperature of the water in which they were laid. The tadpoles that emerge are olive-green across the back with a cream-colored belly. Dark spots cover the back and brown markings splash the pointed, green tail. The tadpoles of the northern green frog remain in that stage at least through one winter. They may transform in less than one year.

Call. The green frog almost always calls from the water, selecting a shallow area where it floats on the surface or squats on the broad leaf of a bullhead-lily or other aquatic plant. The vocal sac is internal and when inflated during calling causes the throat and sides to expand. The green frog emits a low-pitched twangy sound, similar to that produced by plucking one of the lower strings on a banjo or other stringed instrument. A single note is most frequently produced, although it may be repeated three or four times, decreasing in volume with each successive note. It has been described by some people as resembling the slow tapping of a woodpecker.

Food. The diet of the northern green frog is varied and consists of vertebrates and invertebrates. Water striders, dragonfly larvae (also known as mud bugs) and a variety of other insects are consumed by a hungry green frog. Additional prey includes worms, small fish and small crayfish, all easily found sharing this amphibian's habitat.



Pickerel Frog

Rana palustris

General characteristics. Going back to the earliest years of the 20th Century and before, this frog had been a popular bait used by anglers fishing for “pickerel”—hence its name. Today, although frogs still are used as bait, anglers should be aware that regulations affect the number of frogs they may have in possession at any one time. The pickerel frog is a medium-sized amphibian that averages from 1³/₄ to three inches as an adult.

It benefits from a built-in defense mechanism particularly effective against snakes and other animals that normally prey on amphibians. And once experienced, snakes seem to avoid pickerel frogs—and even their lookalikes—thereafter. The pickerel frog secretes a substance from its skin that is at least irritating, but often toxic to would-be predators. It is distasteful and emits an extremely unpleasant odor that even humans find obnoxious. The secretion is toxic to frogs other than its own species and has been known to be fatal to other frogs when placed in the same water-filled container.

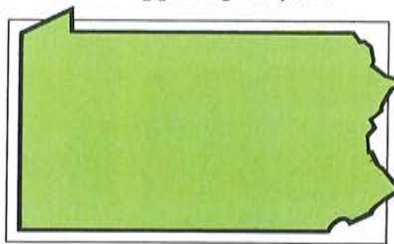
The pickerel frog does not rely totally on its toxic skin secretions for protection. When frightened, it quickly leaps to find cover under shoreline mosses, or by suddenly diving beneath the water, it buries itself in mud lining the pond or stream bottom.

Identification. The pickerel frog is a spotted frog similar in appearance to the leopard frog, but with distinctly different markings. The pickerel frog has two rows of squarish spots down the back, but the leopard frog’s spots are rounded and usually not in rows as well-defined as are those on the pickerel frog. Also, the leopard frog’s wide head is more blunt than the pickerel’s somewhat pointed snout.

The skin of the pickerel frog is smooth with an almost metallic-like lustre. The background color is tan or a light grayish to light brown. The two rows of parallel spots or blotches down the back are contained between the dorsolateral folds. The spots are squarish and although irregularly shaped with uneven lines, clearly are not round. They are black to dark brownish or reddish brown. Small, square-like spots also appear on the sides of the pickerel frog. The belly is whitish up front, becoming bright yellow to orange toward the rear. Dark bars mark the upper surface of the hind legs, which are bright yellow to orange underneath. The leg markings also help distin-

guish this frog from the leopard frog. The folds of skin, the dorsolateral ridges, are prominent and extend to the groin. They are yellowish or creamy to a golden color. A light streak outlines the upper lip or jaw.

Range. The pickerel frog is distributed from Canada's Maritime Provinces in the north to the Carolinas in the south. Its western boundary runs from Wisconsin to eastern Texas. In Pennsylvania, each of the 67 counties has its share of pickerel frogs.



Habitat. This amphibian spends more time out of the water than in it. For the most part, water is used only as a breeding site and a haven from enemies. The pickerel frog prefers slow-moving water. This frog is at home in marshes, but it can also be found along streams and cool springs. During the summer it moves far into grassy fields or meadows that are moist, seeking out damp areas thick with low vegetation. Grassy areas along streams and woodland ponds also provide suitable habitat. The pickerel frog hibernates from October until March, but usually does not go into its winter retreat until pushed there by autumn's first frost.

Reproduction. The pickerel frog breeds during the period April until May, usually a bit later than the leopard frog. Water temperatures in the upper 50s nudge the male to begin calling its mate. The male joins the female in amplexus and fertilizes the eggs as they are released. The eggs are encased in a transparent jelly-like mass about 3½ to four inches in diameter. Breeding is accomplished in shallow water where the globular egg mass adheres to the stalks and stems of standing, sometimes emergent, vegetation. The female lays 2,000 to 3,000 brown and cream-colored eggs. They incubate for several days to perhaps a few weeks, depending on water temperature. The warmer the water, the sooner the eggs hatch.

The tadpoles are greenish and sprinkled with fine black dots. The tail fin is edged in black. They reach about three inches in length. Transformation to young pickerel frogs takes place usually in July or August or 2½ to three months after the tadpoles break free of the eggs.

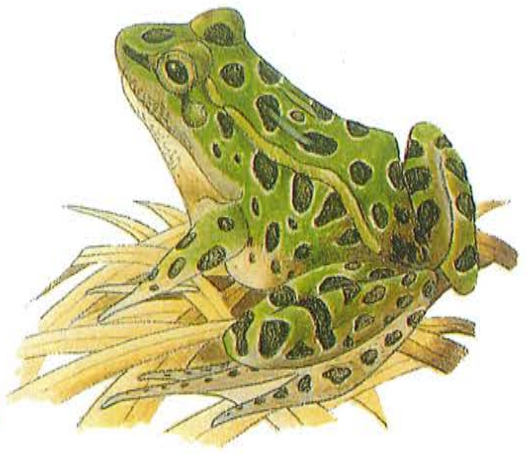
Call. Only the male pickerel frog calls, at times singing beneath the surface of the water from where it sounds like a reverberant snore. At other times the calling is done at the breeding site with a full chorus of other pickerel frogs emitting a slow, low-pitched, steady croak, of one to two seconds duration.

This species uses two vocal sacs. When filled with air, they cause the area between the ear and foreleg to become swollen, producing a puffiness along each side of the head.

Food. The pickerel frog preys on caterpillars, a variety of insects including flies and gnats, crayfish and spiders. Like other frogs, it is carnivorous and feeds on just about anything it can handle.

Northern Leopard Frog

Rana pipiens



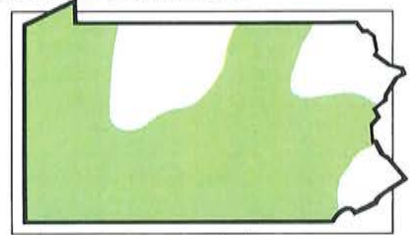
General characteristics. The leopard frog is one of our most attractive frogs. It is primarily nocturnal and prefers to spend the better part of the day in hiding. It comes out at twilight to fill the night air with its song or forage for a meal. Although extremely agile, those who have studied them say that the leopard frog is not as agile as its cousin, the pickerel frog. However, it does take honors for the longest jumper. Even the larger bullfrog cannot cover a greater distance in a single leap. If fleeing from danger, the leopard frog is able to cover a lot of ground, taking three or four long, low erratic leaps, each time going off in a different direction. Average adult leopard frogs attain lengths of two to 3½ inches.

Identification. The leopard frog is slender with relatively smooth skin, although small tubercles cover much of the body. The head is wide, ending in a more or less blunt snout.

The leopard frog resembles the pickerel frog, although the body color is not tan as is usually the case with the pickerel frog. The leopard frog is brownish or green. Its dark spots are round, not the squarish shape of the pickerel frog's spots. The spots appear in two or three rows between prominent dorsolateral folds. The spots are black or reddish brown and edged with a lighter color that produces a halo effect around them. The wide dorsolateral ridges are creamy to yellowish or bronze. Dark spots also appear on the sides below the folds of skin.

The belly is white to yellowish and the throat is white. Each of the legs is clearly marked with dark bars. The under surface of the legs is whitish, not yellow or orange as on the pickerel frog. The upper jaw, which protrudes over the lower, is marked with a light spot or line. A yellowish band streams from the end of the muzzle backward to the shoulder.

Range. The leopard frog ranges far into Canada in the north and south to Kentucky. It extends to enter the eastern edge of the Pacific states. Populations of the leopard frog occupy a large portion of Pennsylvania. It is apparently absent from the northeast, in a general sense the Pocono Mountains; from a small corner in the southeast; and from the extreme northcentral part of the state, encompassing parts of the Allegheny Mountains.



Habitat. During the summer months the leopard frog wanders far from water when it can be seen in moist meadows and fields. It especially likes damp grasslands, but marshes and small ponds also hold colonies of the leopard frog. It cannot withstand a great amount of heat and therefore spends most of its time in areas that are moist and heavily covered with vegetation. Interestingly, the leopard frog resides in brackish marshes as well as fresh water. That cannot be the case in Pennsylvania, though, because it is absent from the southeast counties and the Delaware River estuary, our only potential locale for salt marshes.

After experiencing the heat of summer and land-based excursions, the leopard frog seeks protection from winter's coldest days by retreating to the water. Digging well into loose gravel or sand on the bottom, the leopard frog hibernates until the spring warming trend again brings it scurrying to the surface.

Reproduction. It doesn't take too much of a warming trend to bring the leopard frog out of hibernation. It is among the first frogs to emerge in the spring—perhaps late winter would be a better description—when water temperatures have climbed barely into the low 40s. The mating period can begin in March and continue until May or even June. Breeding takes place in shallow water where eggs are laid encased in a round, flattened transparent gelatinous mass. Thus protected, the egg mass is attached to submerged vegetation, or sometimes rests on the bottom. From 5,000 to 6,000 eggs are released by the female; they are blackish on top with the lower part, the yolk, a creamy white. The yolk is available as a source of nourishment for the new tadpole for several days. Depending on water temperature, the incubation period for the eggs can be as short as four days or as long as a month. Average time to hatching is probably nine or 10 days.

As they escape from the egg, the tadpoles have a brownish body and translucent tail crests sprinkled with small black dots. They remain in this larval stage for two to three months. When they attain a length of about three inches, metamorphosis takes place, and by July or August, frisky young leopard frogs have been welcomed into the world.

Call. Among the leopard frogs, both the male and female can be heard calling, although the female's song is not as loud as her mate's. A pair of vocal sacs expand and collapse as the frog produces its vibrant song. Expanded, the vocal sacs are round, and cause the area above the front legs to swell. Collapsed, the sacs become wrinkled and baggy.

The leopard frog sings early in the spring, usually heard from the shallows of a pond or from deep within a marsh that is just beginning to feel the effects of warmer, longer days. As air is pushed from the vocal sacs, the frog produces a low guttural, reverberant sound, lasting for about three seconds. It ends in a clucking-like grunt.

Food. The leopard frog does most of its foraging as it travels over land, taking insects and other prey from the surrounding grasses. It feeds under water only on rare occasions. Spiders, worms, grasshoppers, and at times, snails add variety to the leopard frog's diet.



Wood Frog

Rana sylvatica

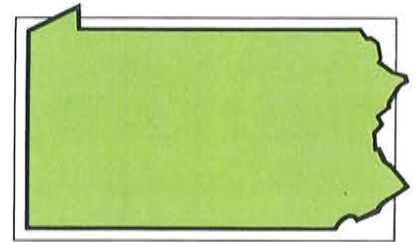
General characteristics. The wood frog is primarily a diurnal amphibian; that is, the frog is most active during the day. Even so, due to its secretive and solitary nature and natural camouflage, it seldom is seen other than during the breeding season. This medium-sized frog's average adult length is $1\frac{3}{8}$ to $2\frac{3}{4}$ inches.

More terrestrial than a lot of other frogs, the wood frog is also capable of jumping farther than most. In addition, when fleeing from danger it is able to turn itself around as it hits the ground to face a startled enemy eyeball to eyeball. Thus prepared, it can take other evasive measures, if necessary.

Identification. The body of the wood frog appears more flat than most other frogs. The head is broad, but ends in a pointed snout. Its skin is relatively smooth and moist to the touch. Although usually a shade of tan, the body also can be pinkish to an occasional dark brown. An important identifying mark is a prominent, dark mask that covers each eye and extends along the side of the head to just behind the eardrum (tympanum). A light line or stripe marks the edge of the upper lip. The chest is marked with a dark spot located near the base of the forelimbs. The white belly sometimes is mottled with darker pigment.

In some specimens, dark bars break up the tan color of the legs, which on the undersides are yellow-white to greenish white. The toes are webbed, but only slightly. The dorsolateral ridges are distinctly evident and extend all the way to the groin. They are a lighter shade than the rest of the body. The wood frog has protruding large eyes, bigger than the tympanum. The gold iris of each eye is darker on its lower half than on the upper half.

Range. The wood frog can find suitable habitat throughout the entire state. This frog is quite adaptable—it is found north of the Arctic Circle, the only North American frog residing in this frosty environment. It ranges across Canada to Alaska in the north and in its eastern range as far south as the southern Appalachians.



Habitat. A terrestrial animal, it ranges far from water during the summer months. It likes shade and moisture, so damp woodlands are a favorite haunt of the wood frog. Well-camouflaged against the dead leaves littering the forest floor, the wood frog spends much of its time here, unnoticed and alone. Although a strong swimmer and able to produce a vigorous kick with its hind legs, the wood frog spends little time in the water except when it breeds. As winter settles over its wooded home, the wood frog burrows beneath the forest debris to hibernate among the leaves or in the soil beneath moss-covered logs.

Reproduction. Along with the leopard frog, the wood frog is among the first to mate and breed. Warm rains are needed to entice the wood frog from hibernation and when the air temperatures reach 50 degrees, the male begins to call his mate. Often, the first singing is heard even before the winter's coating of ice has completely melted from the breeding pond. The male wood frog begins to call as early as February or March. The male greets the female in a day or two and the eggs are quickly deposited by the female and fertilized by the male. The eggs usually are laid in slow-moving pools of streams or small ponds. In the event of a late freeze, the eggs do not die but simply await warmer temperatures to develop. Before releasing the eggs, the mated wood frogs swim close to shore where the water is shallow and warmest. They choose an area with a profuse stand of submerged vegetation, and these stems, branches and shoots receive the globular egg masses as they are deposited. The black eggs are encased in a clear jelly mass that adheres to the plants just below the surface. The wood frog lays between 2,000 and 3,000 eggs and then quickly leaves the breeding site. After being in the water for a little more than a week, the egg masses begin to flatten, float upward to the surface and spread out, looking much like the familiar green scum often found on ponds.

The eggs at this point take less than a month to hatch. The tadpoles leaving the tiny eggs are greenish olive and have high tail crests (See Figure III-17). They remain in the tadpole, or larval, stage for about two months.

Call. Only the male wood frog calls and he may do so while floating on the open surface of the mating pond. The song is heard early in the breeding season, about the only time the wood frog vocalizes. The call consists of a series of short, raspy duck-like quacks, each about one second in duration. At times, the wood frog may produce a clacking noise, but it always sounds hoarse. The call of the wood frog is not heard over great distances.

Food. The moist forest home preferred by the wood frog provides a varied menu. This amphibian of the woods preys on numerous insects and other small invertebrates.



Figure III-17

The high tail crests, typical of wood frog tadpoles, are not yet apparent on these larvae just emerging from the egg mass.



Figure IV-2, The Blanding's turtle is a candidate species in Pennsylvania.

Figure IV-4, The carved pyramids on the carapace of the wood turtle are actually large scales.

