MERIT BADGE SERIES

REPTILE AND AMPHIBIAN STUDY

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REPTILE AND AMPHIBIAN STUDY

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Requirements

Scouts should go to www.scouting.org/merit-badges/Reptile-And-Amphibian-Study or check Scoutbook for the latest requirements.

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Scouts must not use venomous reptiles in fulfilling requirement 8a. When you decide keeping your specimen is no longer possible or desired, be sure to find another appropriate home for it or return it to the wild at the location of capture. Check with your merit badge counselor for those instances where the return of these specimens would not be appropriate.

Under the Endangered Species Act of 1973, some plants and animals are, or may be, protected by federal law. The same ones and/or others may be protected by state law. Be sure that you do not collect protected species. Your state may require that you purchase and carry a license to collect certain species. Check with the wildlife and fish and game officials in your state regarding species regulations before you begin to collect.

Tree frogs use their adhesive disk toes to climb vertical surfaces.

Contents

Treat the animals you observe with care and respect.

Texas spiny softshell turtle

What Are Reptiles and Amphibians?

Scouts always have been interested in snakes, turtles, lizards, and alligators, as well as frogs and salamanders. Finding one of these animals can create excitement on any Scout camp, hike, or outing. Most reptiles and amphibians are harmless, and many species can be kept in captivity with proper care and attention.

Developing knowledge about these captivating creatures leads to an appreciation for all native wildlife. Understanding the life cycle of a reptile or amphibian and keeping one as a pet can be a good introduction to natural history. Knowing about venomous species, and what to do in case of a snakebite, can help you to be prepared in case of an emergency.

Reptiles include turtles, lizards, snakes, crocodilians (alligators, crocodiles, and relatives), and tuataras. Most reptiles are covered with scales that often are enlarged into shields or plates, and their toes have claws. As is often true in biology, however, exceptions exist. For instance, the great leatherback sea turtle has flippers but no claws; snakes and glass lizards have no legs at all; and softshell turtles no longer have scales, except for a few on their limbs. Young reptiles closely resemble their parents, but their colorations and patterns might be different.

A friend of ranchers and farmers, the Sonoran gopher snake is a large, powerful constrictor that feeds on crop-damaging rodents. This harmless snake often bluffs by hissing and shaking its tail to scare away would-be predators.

The pickerel frog's strong legs are well-adapted for leaping.

Amphibians include salamanders, frogs, toads, and caecilians. Unlike reptiles, they have moist, glandular skin instead of scales and, except for a few species in which the toes have hardened tips, none have claws. Most amphibians pass through a *larval stage* (called *tadpoles* in frogs and *larvae* in salamanders), usually in the water, before changing into the adult form, a process called *metamorphosis.*

Reptiles and amphibians are *vertebrates,* meaning they have a backbone, just as mammals, birds, and fishes do. Insects, worms, shellfish, and other animals without backbones are called *invertebrates.*

Classifying Reptiles and Amphibians

A *specimen* is a single member of any species.

Every type of animal has traits that set it apart from all other animals. Zoologists (biologists who study the animal kingdom) use those differences to organize animals into a classification system. A *species* is a group of animals that can pass along its distinctive characteristics to its offspring. Under most conditions, the individuals of a species do not interbreed with those of other species. A group of closely related species that share common attributes constitutes a *Genus.*

The study of reptiles and amphibians is called *herpetology.* The word is derived from the Greek words *herpeton,* meaning a reptile or creeping thing, and *logos,* meaning to study. A person who studies these animals is called a *herpetologist.*

Reptiles and amphibians within a species often vary little in appearance. For example, a snake from your state may look much like one of the same species from another state. But species with wide distributions, in a few cases stretching from coast to coast or from the South to New England, may have geographic variations, and individuals in one part of the range may look different from those in another part. Subspecies, these geographic races of a species, can breed with one another

A species' *scientific name* is made up of the *genus name,* which is placed first and capitalized, followed by the *species name;* both are italicized. For example, the scientific name of the common king snake is *Lampropeltis getula.*

where the boundaries of their ranges meet. A good field guide can help you determine subspecies in your area.

The *range* of a species refers to its natural distribution—that is, the geographical extent of its occurrence in nature. This is usually given in terms of the states, or sections of the country, where a species is found.

An animal's *habitat* is the type of environment in which it lives. Some species need to live in or near water, and their habitats are said to be *aquatic* or *semiaquatic.* Others are suited to hot, dry conditions, so their habitat may be the desert. Some kinds rarely leave the surface of the ground, while others prefer to live in trees or on rock faces. Some have single specialized habitats such as caves, springs, or around the edges of ponds. Others live only in sandy areas or places where certain types of vegetation grow.

Habits describe an animal's behavior and natural history—how it finds, captures, and swallows food; whether it lays eggs or its young are born alive; whether it hides most of the time or is active above ground; whether it is active mostly at night *(nocturnal)* or during the day *(diurnal);* whether it climbs, swims, or burrows, and so on.

In different parts of its geographic range, the same species of snake can vary in appearance, such as the rat snakes shown above.

Some species of reptiles and amphibians require highly specialized habitats. The mangrove salt marsh snake lives in the brackish waters and saltwater mangrove swamps of southern Florida.

The plains black-headed snake is a secretive, harmless, rear-fanged species.

How Snakes Move

It is fairly easy to observe how turtles walk and frogs leap, but figuring out how snakes slither along is not quite so obvious. Serpents are very flexible, with a pair of movable ribs for each of the large *ventral scales,* or plates, on the abdomen. A system of muscles connects these ribs to the outer edges of the ventral scales. As the snake flexes these muscles, the free, outer edge of the scales will catch on any small projection or surface irregularity, giving the snake locomotion. Using this method of crawling, many kinds of snakes can move in a straight line. Few of them do, though. They usually take advantage of the terrain and use various projections as pivots against which they can push as they move forward. With this method, the body moves in S-curves as it follows the head.

Like some other desert species around the world, the American sidewinder flips sideways to achieve locomotion. Some aquatic snakes swim by using the S-curve method against the resistance of the water.

To watch how a snake crawls, put an inch or two of fine sand or gravel in an aquarium or large clear container and tamp the material down. Then put a small or medium-size nonvenomous snake in the container. Set the container on a shelf so your eyes are level with the snake's belly. You will see the movements of the scales as the reptile crawls along.

The Brazilian rainbow boa is a beautiful and powerful boa of the South American tropics.

Taking Count

It is impossible to determine exactly how many species of reptiles and amphibians occur within the borders of the United States because those numbers are constantly changing. New species still are occasionally discovered, especially among the amphibians. Formerly nonnative species from Mexico and other tropical locations are starting to be found in southern states. Research sometimes indicates that what once was thought to be a pair of separate species is actually two subspecies; or, despite outward appearances, it is discovered that two species exist where previously there was thought to be only one. Still, such additions and deletions do not occur very often, so an approximate list of species is a good estimate for general study.

Like the iguana, above, some species of reptiles and amphibians from other countries have become established in the United States, especially in southern Florida.

Approximate Number of Native North American Species*	
Snakes	119
Lizards	91
Turtles (including sea turtles)	50
Crocodilians	2
Frogs and toads	82
Salamanders	113
Total	**457**

*These figures are estimates that apply only to species native to the 48 contiguous states.

General Distribution

More kinds of amphibians, and many more kinds of reptiles, live in the southern part of the United States than in the northern part. Unlike endothermic mammals and birds, most reptiles and amphibians are ectothermic, meaning their body heat comes from their environment, instead of from their metabolism. Most reptiles control their body temperature by their behavior, for example, by basking in the sun when too cold or seeking shelter in the shade when too warm. Most amphibians become the same temperature as their environments.

Habitat preferences also influence distribution. Frogs, salamanders, and most turtles need to live in aquatic or moist environments, such as are abundant in the East and Southeast. Frogs and salamanders also populate moist areas of the Pacific states.

Reptiles and amphibians are ectothermic—the external environment dictates their body temperatures. Most reptiles use their behavior to further heat or cool their bodies; most amphibians do not. The Western painted turtle is commonly seen warming itself by basking along ponds and streams in the western U.S.

Some kinds of snakes, as well as the American alligator, are *semiaquatic,* spending some time in the water and some time on land. Other snakes are at home in woods, mountains, plains, or prairies. Still other snake species have adapted to life in the desert, where they avoid the daytime heat by living in underground burrows and emerge only at night.

In general, lizards prefer dry conditions and are most abundant in the Southwest, although many kinds of lizards, notably skinks, also abound in the more humid southeastern states. Several kinds of toads and tortoises dig burrows that can extend many feet underground to help them tolerate dry conditions. For example, spadefoot toads in arid regions can remain hidden underground for months at a time, emerging suddenly, and in enormous numbers, when a rare heavy rain forms temporary pools suitable for laying eggs and developing tadpoles.

The greatest number of frog varieties is found in Texas, followed by Florida, South Carolina, Georgia, and Alabama. North Carolina, Georgia, Virginia, and Tennessee have the most salamander types. Texas has the most species of snakes and lizards, followed by Arizona and New Mexico. More turtle species live in Alabama than in any other state, although Texas and Georgia have almost as many. Alligators are found in all the southeastern states, but southern Florida is the only region in the United States with crocodiles.

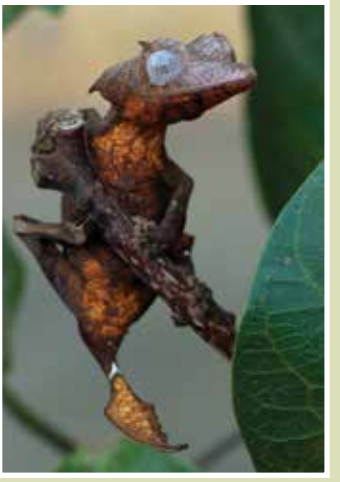
The Eastern spadefoot spends most of its time burrowed underground, emerging only briefly after heavy rains to breed. This unusual creature has vertical catlike pupils and uses a single small projection on its hind feet to burrow.

Many harmless garter snake species and subspecies can be found throughout much of North America. They hunt amphibians, worms, slugs, and other small creatures in a variety of habitats.

Off the Mainland

Scouts living in Alaska, Hawaii, Puerto Rico, and the Virgin Islands will have to take certain differences into consideration. If you live in one of these areas, consult with your merit badge counselor on the best way to complete requirements 6, 8, and 9.

Alaska has only three salamanders, two frogs and a toad, and a single species of snake. Most of these are confined to the extreme southern part of the state.



The well-camouflaged leaf-tailed geckos are native to the vanishing tropical forests of Madagascar.

Hawaii has about two dozen kinds of reptiles and amphibians, almost all of them introduced from other parts of the world. Many have restricted ranges, living only in the areas where they were introduced. Three kinds of sea turtles occasionally appear along the shores of the Hawaiian islands, and the venomous yellow-bellied sea snake has been seen there on rare occasions.

Puerto Rico has fewer species and lower populations of reptiles (fewer than 50 species) and amphibians (approximately two dozen species of frogs and no salamanders) than mainland areas of comparable size in the southern United States.

The Virgin Islands collectively have about as many species as Hawaii. However, as in all archipelagos, some kinds are found on certain islands and missing on others.

Identifying Reptiles and Amphibians

The best way to become skilled at recognizing, identifying, and distinguishing species of reptiles and amphibians is to observe the live animals. Use a field guide for your region to learn about the different species. Most guides will tell you what features are used to distinguish one species from others of similar appearance.

Alligators and Crocodiles

Crocodilians include alligators, crocodiles, caimans, gharials, and others. The American alligator is the most common species throughout the southern U.S., although American crocodiles live in areas of the Caribbean (including south Florida) and Mexico, and spectacled caimans live in Central America. The easiest way to distinguish between the American alligator and the American crocodile is to look at the head. The alligator has a broadly rounded snout, whereas the crocodile's head is almost pointed. American alligators live primarily in freshwater,

Most crocodilians were seriously overhunted for the pet and leather trades through the mid-1960s and are now protected by strict laws.

The shape of the snout can be used to distinguish among the three species of North American crocodilians. This is an American alligator.

while American crocodiles prefer saltwater coastal areas. Adult alligators are almost black, while American crocodiles are more of an olive brown color. The fourth tooth on each side of the American crocodile's lower jaw is quite large and in big specimens fits into a groove on the outside of the upper jaw.

Frogs and Toads

Although all toads are scientifically considered to be frogs, the common names "frog" and "toad" are often used by the layperson to describe two generally different animals. "Frogs," in general, have smooth, moist skins and lack the conspicuous bumpy warts and relatively dry skins characteristic of

Bullfrogs have declined in some areas, but they have been introduced into areas outside their natural range where they now thrive and compete with native wildlife.

Toads—like the Woodhouse's toad—have dry, warty skins. Their legs are relatively short and adapted for hopping.

Always handle amphibians as briefly as possible, with clean, wet hands. Wash your hands after handling any animals.

Like most salamanders, the spring salamander has a smooth skin and no claws on its toes.

toads. Some frogs, such as the bullfrog and leopard frog, have webbing between the toes of their hind feet that aids in swimming. "Toads" have short hind legs, and when they move they hop. Frogs have long hind legs and leap. Toads are much easier to catch than frogs, so toads have another way of avoiding enemies. Their warts secrete a fluid that is distasteful or even poisonous to many small animals.

Lizards, Salamanders, and Newts

Lizards and salamanders are easy to tell apart. Lizards (reptiles) are covered with scales, their toes have claws, their skins are dry, and they are more likely to be found in the sun. Salamanders (amphibians) have smooth, moist skins, their toes are clawless, and they avoid exposure to the sun. Newts have rougher, drier skins than other kinds of salamanders, but they do not have claws. Newts are exclusively aquatic in the larval and adult stages, but some have an intermediate land form, known as an *eft,* that later readapts to the water.

The Savannah monitor lizard is a popular pet species that often outgrows its home. It is important to think long-term about the adult size and life span of pets *before* you adopt them.

Like all lizards, the skink has claws on its toes and scales on its head, body, and limbs.

The chuckwalla is a large lizard of the southwest deserts that likes to sun itself in rocky areas. When threatened, these amazing herbivorous reptiles quickly crawl deep into rock crevices, gulping air to inflate their bodies and wedge in tight.

Like the Gila monster, most North American snakes and lizards lay eggs. However, water snakes, garter snakes, all North American pit vipers, and some horned lizards all are live-bearers.

Snakes and Legless Lizards

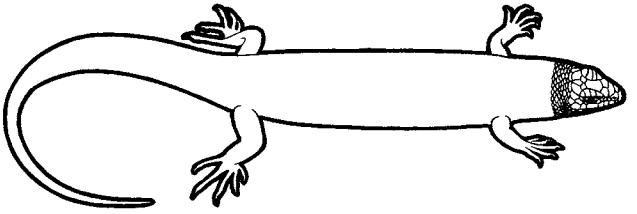
Most snakes have the same general body form—they are limbless and usually slender. While most lizards have four legs, the glass lizards of the South and the legless lizards of California lack limbs entirely and are easily mistaken for snakes. But unlike snakes, legless lizards have eyelids and their bodies are rather stiff. In addition, glass lizards have external ear openings, whereas snakes do not. The worm lizard of Florida also is legless, and its eyes are covered by scales and are often invisible.

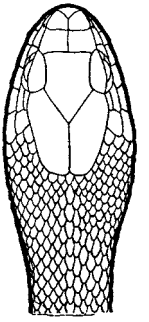
Live-bearing reptiles retain the eggs in the mother's body until hatching time; the young are, in essence, born alive.

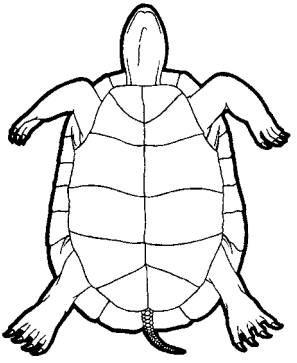
The shy and beautiful trans-Pecos rat snake is a harmless, secretive, nocturnal creature found in the rocky canyon area of West Texas, where it hunts for desert rodents.

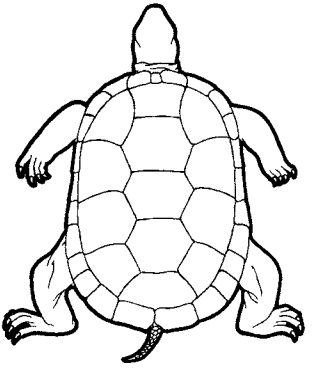
Sketching Live Animals

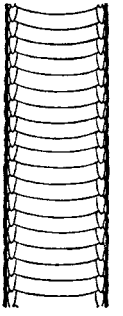
Making sketches from live animals is one way to become familiar with their physical qualities. Even if you are not artistic, this method is easy if you follow the outline drawings below.

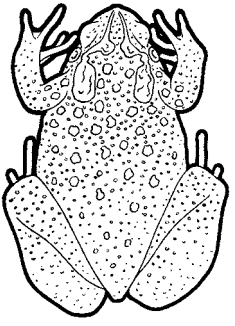


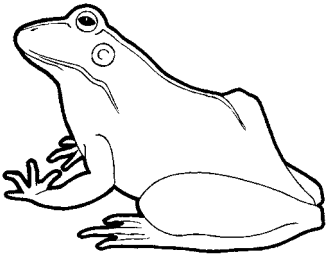


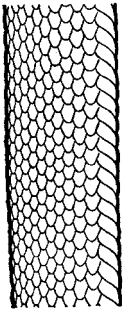




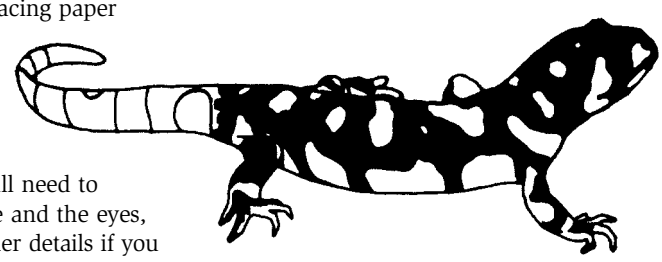






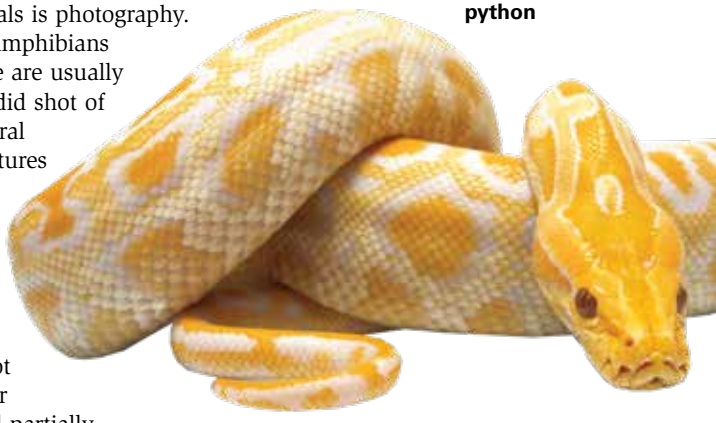


Put a piece of tracing paper over the drawing of the reptile or amphibian similar to the one you want to record. In most cases you will need to copy only the outline and the eyes, but you may add other details if you wish. When your drawing is complete, use a pencil to sketch the outstanding features such as spots, stripes, or mottling just as you see them in your specimen. These may be filled in later with hatching, stippling, or shading to indicate the various tones of coloration. The partially completed drawing of a salamander, shown here, was prepared this way from the specimen shown in the photograph. You could also trace a picture from a magazine or book, or make your own freehand sketches.



Photographing Live Creatures

Another approach for learning the identifying characteristics of animals is photography. Pictures of reptiles or amphibians being held by someone are usually not as lifelike as a candid shot of the creature in its natural habitat. Catch the creatures first or use tame specimens. Place each subject in an open area—on a rock, a background of leaves or pebbles, or some other surface that is not cluttered with weeds or foreign matter that will partially obscure them.



Albino Burmese python

If you are working with a protected species, check local regulations and handle it correctly. If an animal appears stressed (excessively trying to escape, biting, heavy breathing, drying out, etc.) release it immediately. Be careful to replace any logs or rocks to their exact original placement, and always release animals exactly where they were found.

Some species always seem to be moving and are difficult to photograph, so get another Scout to help you. Have your partner hold the creature gently in place while you adjust your camera. When you are ready, instruct your partner to release the creature. In most cases the creature will remain still for at least a second or two while you snap your picture. Try for close-ups, and be sure that the characteristics important to identifying the species are obvious in the photograph.

The Importance of Reptiles and Amphibians

Reptiles and amphibians play vital roles as predators, prey, and as part of the fundamental framework of nature.

In earlier times in North America, some species were considered useful as food items, skins, or pets. Today, many species that have commercial value are in serious trouble because they have been overharvested or otherwise killed in their natural habitats and now must be protected by federal and state laws. In a few instances, reptiles and amphibians can be raised commercially as food,but such ventures often are unsuccessful.

Most lizards, frogs, toads, and salamanders eat insects, helping to control grasshoppers, crickets, ants, beetles, and other insects that can become pests when overly abundant. Snakes that prey on rats and mice help control rodent outbreaks. Because of their streamlined shapes, snakes can pursue rodents into burrows and other narrow spaces where other predators cannot enter. Rat snakes, milk snakes, king snakes, racers, bull snakes, whip snakes, rattlesnakes, and copperheads can be extremely useful in this regard. Water snakes and cottonmouths eat dead and diseased fishes that might otherwise infect healthy aquatic animals. Snake venom is used in producing many life-saving medications.

Numerous arboreal (tree-dwelling) snakes have bright green coloration to help them blend with foliage.

Catching Prey

The diamondback terrapin is the only species of turtle that lives in the brackish waters of the salt marsh, between the ocean and freshwater. It is found along the coast from Cape Cod to Texas.

Methods of catching, killing, and engulfing prey vary among reptile and amphibian species. Turtles simply seize their food and attempt to tear off pieces with their strong beaks, sometimes securing it with their forefeet. Many turtles eat both plants and animals. Lizards, which eat mainly insects and other invertebrates, grab their prey in their mouths and gulp it down. If the prey is large and struggling, they may press or hit it against a stone, log, or the ground to subdue it. Alligators and crocodiles crush snakes, fish, ducks, and even turtles in their powerful jaws, or they might drown larger prey, such as raccoons or deer.

Snakes eat only other animals and have a number of ways of subduing prey. Some, such as king and rat snakes, are constrictors. They tighten their coils around a mouse or other prey until its breathing has ceased, and then swallow it. Racers and whip snakes seize prey in their mouths and then throw a coil over it, pressing the prey firmly against the ground. Water and garter snakes hold their prey tightly in their mouths while it struggles, then gradually swallow it. Most venomous snakes attack large prey, such as rats, by striking, letting go, and waiting for the venom to do its work. They then crawl to the dead or dying animal to consume it.

The corn or red rat snake is a handsome constrictor found throughout the Southeast. Large numbers of corn snakes are bred in captivity and make good pet reptiles. Remember to carefully research the needs of any pet to make sure it is right for your family.

Many amphibians have long, sticky tongues they flick out to seize a moving insect. Some aquatic species suck in their prey like a vacuum cleaner. Most adult amphibians eat only other animals, primarily invertebrates, and not plants.

Wildlife Protection Programs

An endangered species is defined as "any species in danger of extinction throughout all or a significant portion of its range." The Endangered Species Act of 1973 is a powerful law that makes it illegal for a person "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any animal on the endangered species list. Punishment for breaking endangered species laws includes fines of up to $50,000 and imprisonment for up to one year.

Many species are on the federal endangered species lists, including the San Francisco garter snake, the Plymouth red-bellied turtle in Massachusetts, the Wyoming toad, the Texas blind salamander, and several species of sea turtles.

Most states have regulations protecting one or more kinds of reptiles and amphibians. Some states protect all species. Some states offer protection for species that are rare or whose populations are declining. For example, Arizona protects the Chiricahua leopard frog, Illinois protects the Illinois mud turtle, California protects the blunt-nose leopard lizard, and New York protects the northern cricket frog.

A species' protected status can change, though. The American alligator became a federal endangered species in 1975, but as its population increased its status was upgraded to *threatened,* and then removed from the list altogether. Control of the species was then turned over to the states to allow restricted hunting.

All species of sea turtles found in the offshore waters of North America are protected federally as endangered species. Marine turtles spend their lives at sea, but females go ashore to lay their eggs.

To be accurate and up-to-date about the laws in your area, consult your merit badge counselor or check with your state's fish and wildlife agency. You can check the agency's website for this information. To obtain a list of federally designated endangered species, go to www.fws.gov/endangered/

Some state restrictions protect species during their breeding seasons. Others protect rare and vanishing species at all times from threats like commercialization, indiscriminate collecting, or needless slaughter.

The federally protected eastern indigo snake of the southern United States can grow to be more than 8 feet long.

White's tree frog is a widespread species from Australia and New Guinea, where they prey upon insects and other garden pests.

Water dragons are light-loving, semiaquatic lizards of Australia and Asia.

Reproduction

Strictly speaking, all reptiles and amphibians hatch from eggs, but the methods of courtship, fertilization, laying of eggs, and incubation differ widely. Here, in brief, are what might be called typical reproductive patterns.

Frogs and Toads

Most species of amphibians spend time on land as adults but lay their eggs in water. At mating time for frogs and toads, the male grasps the female from behind, placing his arms around her waist or under her armpits in a position called *amplexus.* As she lays her eggs he releases sperm, some of which enter the eggs. Fertilization is thus external, as it is among most species of fish. The eggs develop rapidly unless the water is very cold.

Tadpoles hatch from the eggs, and after a growing period ranging from a few weeks to two years, depending on the species, the tadpoles develop legs and lungs and become froglets or toadlets. Some kinds of frogs, notably those in the tropics, lay their eggs in damp places on land, and development takes place entirely in the egg. Other species beat the egg jelly into froth, and the tadpoles live in the liquefied center of the mass until rains wash them into nearby pools.

Most frogs and toads mate in the water, where the female deposits eggs to be fertilized.

The draining of natural wetlands can result in death for larval amphibians like these tadpoles.

Many salamanders are terrestrial most of the year but depend on temporary ponds to lay their eggs. Some, such as the marbled salamander, remain with their eggs prior to hatching.

Salamanders

During spring or winter rains, male and female salamanders go to shallow wetland ponds. After preliminary courtship maneuvers, the males deposit *spermatophores,* tiny white packets of sperm that are roughly cone-shaped. The female picks these up with her *vent,* and her eggs are fertilized internally. Once hatched from the eggs, the fishlike salamander larvae have external gills and live in the water for varying lengths of time, depending on the species and local weather conditions, before they transform into adults.

In some species, notably the mole salamanders that live in most of the United States, some larvae may mature and reproduce without transforming into land-dwelling adults. Some types of woodland salamanders lay their eggs in moist underground cavities or under rocks or logs, and development takes place entirely in the egg. The large (more than 3 feet long) aquatic salamanders of the Southeast, known as sirens and amphiumas, lay their eggs in the water where they live.

Snakes

Fertilization is internal among reptiles. The mating process is similar to that of mammals, except for the curious fact that male snakes and lizards have two organs for copulation, called *hemipenes,* that lie side by side, hidden inside the base of the tail. One of the hemipenes turns outward during mating. In many species, each hemipenis is covered with small spines that help to hold the organ in position in the female's body opening until mating is complete.

In general, copulation among snakes and other reptiles takes place a considerable time before the eggs are actually laid. The sperm may remain active in the female's body for varying lengths of time, at least in the cases of some kinds of snakes and turtles. In some species, more than one clutch of eggs may be fertilized from a single mating, even after a year or more. Mating in most parts of the continental United States usually takes place in spring but also has been recorded at other seasons, notably in autumn.

Roughly half of North American snake species lay eggs, which they deposit inside decaying logs or stumps, in rotting leaves, in piles of rocks, or in other places where they are completely out of sight. In a few species, such as the smooth green snake, hatching may take place within a few days. For other species, it might be many weeks before the young escape from their shells. Usually the mother snake abandons her eggs soon after laying them, although pythons and some cobras in the tropics remain with their eggs. Examples of native snakes that lay eggs are the racers and the worm, ringneck, rat, milk, king, and coral snakes.

The other half of North American snake species retain the eggs within the mother's body until development is complete and the young are born alive. Instead of being encased in relatively tough, parchmentlike shells like the egg-laying snakes, the young are covered by a thin membrane that they break through shortly after leaving the mother's body. Snakes with this type of reproduction include the garter, water, and brown snakes; rattlesnakes; copperheads; and cottonmouths.

Turtles

All turtle eggs are laid and hatched on land. Even the great sea turtles go ashore to lay their eggs, finding a suitable spot, often in slightly moist sandy or loamy soil, and excavating a cavity with the hind legs. When the eggs are laid, the female turtle scoops and packs the sand or soil back into the hole. She may crawl back and forth, dragging her shell, to conceal the nest. Weeks or months later, depending on the species and the weather conditions, the eggs hatch.

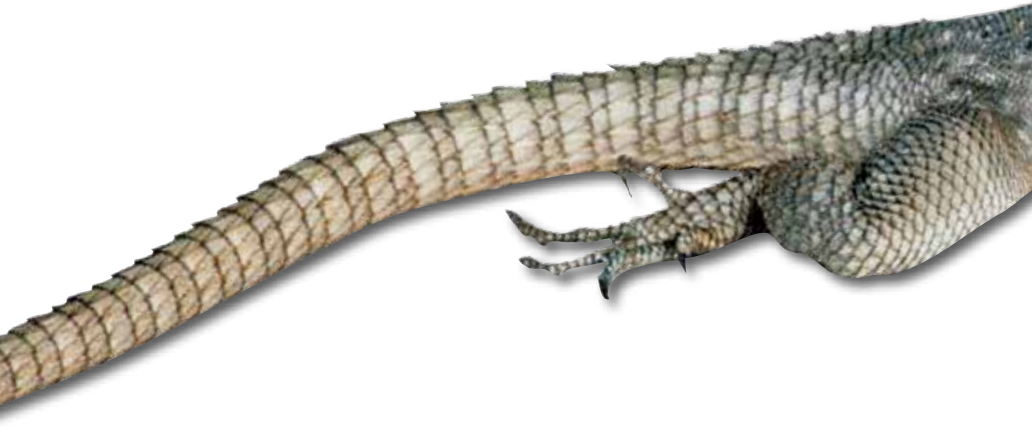
All turtles, including snapping turtles, lay eggs that hatch after several months in an underground nest.

Most freshwater and land turtles lay eggs in late spring and early summer. Some kinds of turtles nest twice or more in a season. Hatching for most turtles takes place by early fall, but hatchlings of many species do not leave the nest at that time. They remain in the protected cavity through autumn and winter and emerge the next spring. Hatchlings of aquatic species move toward the nearest water; hatchling land turtles seek the nearest moist cover.

Alligators and Crocodiles

Alligators build nest mounds of vegetation debris—measuring 4 to 7 feet in diameter and 2 to 3 feet in height—near the water. The mother alligator lays her eggs in the mound, where heat from the decomposing vegetation helps incubate the eggs. The mother may remain nearby to guard them and also to uncover them when hatching time arrives. Crocodiles have similar nesting patterns, although some deposit their eggs in the sand like turtles.

Young alligators and crocodiles are vulnerable to other predators and stay in the vicinity of their protective mother for several months after birth.

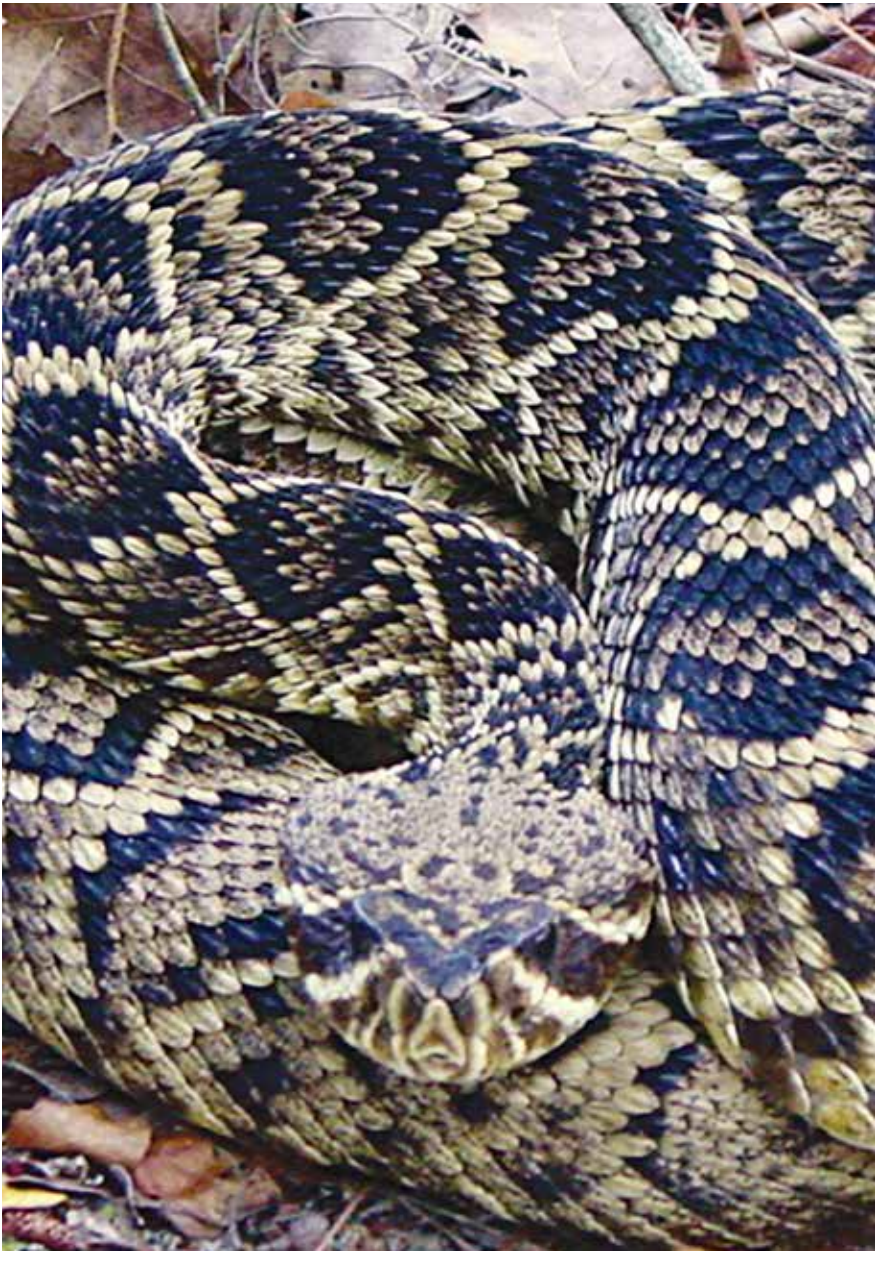


In many reptiles, including all crocodiles and alligators, most turtles, and some lizards, the gender of the offspring is determined by egg incubation temperature rather than genetics. In crocodiles, warmer incubation temperatures produce males and cooler temperatures produce females. In turtles this tends to be just the opposite. Studies of some lizards, such as leopard geckos, have shown temperature-determined gender as well.

Lizards

Most North American lizards lay eggs in hidden, slightly moist places. A few kinds, such as some of the horned lizards and alligator lizards of the western United States, bear living young in the same way many snakes do. Many species of lizards guard their eggs. Some assist in incubation by basking in the sun and then returning to their nests where some of the heat they have absorbed is transferred to the developing embryos.

Lizards can be distinguished from salamanders by their dry, scaly skin, external ear openings, and clawed toes.



The eastern diamondback rattlesnake is the largest venomous snake found in the United States.

Venomous Reptiles

While most reptiles are harmless and all are beneficial to the natural balance of life, knowing the distinctive traits of venomous reptiles can help avoid unpleasant encounters.

In selecting six kinds of venomous snakes to complete requirement 7, include any that live in your area. Field guide maps will quickly show you which snakes live in your state. For example, there are three species of rattlesnakes in North Carolina, eight in Texas, and 11 in Arizona.

Snakes

While potentially dangerous to humans, snake venom was evolved to help snakes kill and digest their prey. We have learned that far more North American snakes are venomous than was thought. Many common, harmless snakes like garter, water, and ring-necked snakes are technically venomous and rear-fanged, but their venom is far too weak to be dangerous. For more about rear-fanged snakes, see page 45. In this guide, "venomous snakes" will refer to dangerously venomous front-fanged snakes.

The large, venomous western diamondback rattlesnake of the Southwest has a distinctive raccoon-like banded tail.

At least one kind of venomous snake is found in each of the 48 contiguous states except Maine and Delaware. Native venomous snakes are not found in Alaska, Puerto Rico, the Virgin Islands, or Hawaii, except the yellow-bellied sea snake.

Learn to recognize venomous snakes on sight by studying color pictures of them or visiting a zoo or natural history museum. To incorrectly guess a snake's identity could mean disaster, so you must know the venomous species in your area. Be familiar with the appearance of at least one species of each of the three types of pit vipers and one of the coral snakes. The safe and simple rule is never to pick up a snake unless you are certain what kind it is and know that it is not dangerous.

For a while after its death, a venomous snake retains much of its reflex action, and its venom remains potent. Poke a "dead" snake vigorously with a long stick to be absolutely sure the snake is dead before you touch it, and do not risk catching your finger on a fang.

Pit Vipers

All species of pit vipers—rattlers, copperheads, and cottonmouths—have a common characteristic: *facial pits.* These deep openings on each side of the head, just below the middle of an imaginary line drawn between the eye and the nostril, are heat-sensitive and help in the detection of warm-blooded prey such as birds and small mammals. They also help the snake take aim when it strikes. The location and appearance of the pits make the snake look almost as though it has four nostrils. All snakes with such pits are venomous.

None of North America's native snake species are normally aggressive. Snakes almost always will get out of the way if they know you are there. However, an occasional cottonmouth or rattler will stand its ground, and any snake might defend itself by striking if provoked.

Pit vipers have two other characteristic traits. First, the scales under the tail are arranged in a single row, except near the tip, whereas in the coral snakes and most nonvenomous North American snakes, the scales beneath the tail are in a double row. Second, pit vipers have eyes with vertically elliptical (catlike) pupils, although several other kinds, notably rear-fanged snakes, have similar eyes.

The heat-sensitive pit between the eye and nostril on the pit viper's head is used to detect warm-blooded prey in the dark. Pit vipers have elliptical pupils, whereas most nonvenomous North American species have round pupils.

Venomous North American snakes rarely advance more than half their own lengths to strike.

These characteristics—pits, scale patterns under the tail, and elliptical pupils—are not usually helpful in identification as field marks because one must get dangerously close to the snake, or actually handle it, to see the marks clearly. But they are helpful in checking out a dead specimen.

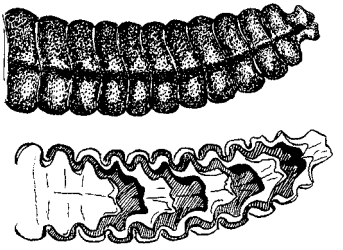
During autumn, pit vipers in some northern and western areas begin to congregate near dens or denning areas where they will spend the winter. On warm autumn days and again in early spring, they sun themselves near the den openings, sometimes in large numbers. During warmer weather they wander afield, but they return to the *hibernaculum,* or winter den, when the days grow cold.

Snakes have no ear openings.

Many people think the shape of a snake's head can distinguish whether it is dangerous or harmless. Do not depend on that myth. Pit vipers have heads that are noticeably wider than their necks, but so do a number of nonvenomous species, such as some of the larger water snakes. The only way to be certain is to know your snakes so well that you can distinguish species at a glance. If you are not sure, do not take a chance.

RATTLESNAKES

The rattle, characteristic of all rattlesnakes, is composed of numerous dry, horny segments that fit together loosely. At birth the baby rattler is equipped with a button, but after the first shedding of skin, a new rattle segment appears at the base of the tail—and so on with each subsequent shedding. At first, each segment is larger than the previous one, but by the time a rattlesnake is fully grown, all the newer segments are about the same size. It is unusual to find a rattlesnake with more than 12 to 15 segments in its string; the ones at the end generally are lost through wear and tear.



Rattle and cross-section. The individual segments of the rattle fit loosely into one another and produce a loud buzzing noise when the snake vibrates its tail.

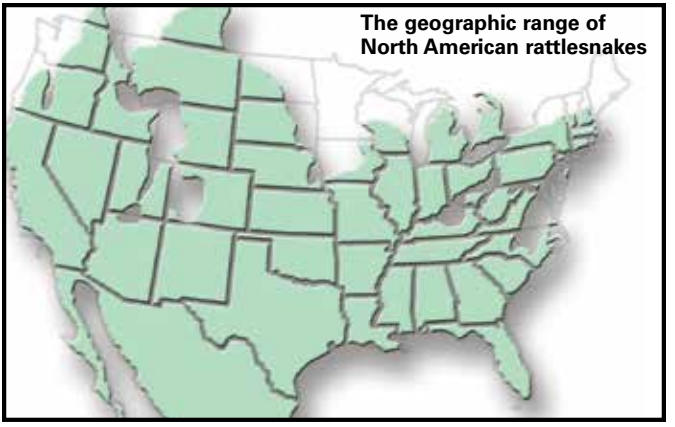
The dusky pygmy rattlesnake is a small, pinkish venomous species found in a variety of southeastern woodland habitats. These snakes have nine large scales on the top of their heads compared with the smaller scales found on most larger rattlesnake species.

The rattler's tongue is soft, moist, and flexible. It is a sense organ.

A venomous snake does not have to be coiled to bite.

When a rattler is disturbed it vibrates its tail, producing a continuous sound much like a loud hissing or buzzing. In general, large rattlesnakes make loud noises and small rattlesnakes make softer ones. The rattle of the pygmy rattlesnake is so faint it can be heard only a few feet away. The big diamondbacks have rattles loud enough to give you a good scare from several feet back.

The timber rattlesnake is the widest-ranging large rattlesnake of the eastern United States. Adults can be from 36 to 60 inches long or longer. In the southern states, the species is called the canebrake rattlesnake.



A buzzing noise in the field is not necessarily the warning of a venomous snake. It could be one of many harmless snakes, including racers, king, milk, and pine snakes, that vibrate their tails rapidly when alarmed and can sound much like rattlers if they happen to be among dry leaves. Treat all such noises with caution.

COPPERHEADS

The copperhead gets its name from the coppery-red color of the upper surface of the head. In eastern localities, the snake is marked with reddish-brown or chestnut hourglasses that cross the back. In the far western part of the range, the markings are much wider and take the form of rich, reddish, crisscrossing bands. Over a large part of its range, the copperhead inhabits rocky, wooded areas. It also is found on the coastal plain and even in swampy areas in the South, where it occasionally coexists with the cottonmouth.

Several other species have reddish coloring and are often mistaken for copperheads and killed. Never kill any snake out of fear. Venomous snakes are important to the ecosystem and generally are not dangerous if treated respectfully.

Copperheads live in rocky, forested uplands of the North and throughout lowlands in the South.

The geographic range of North American copperheads

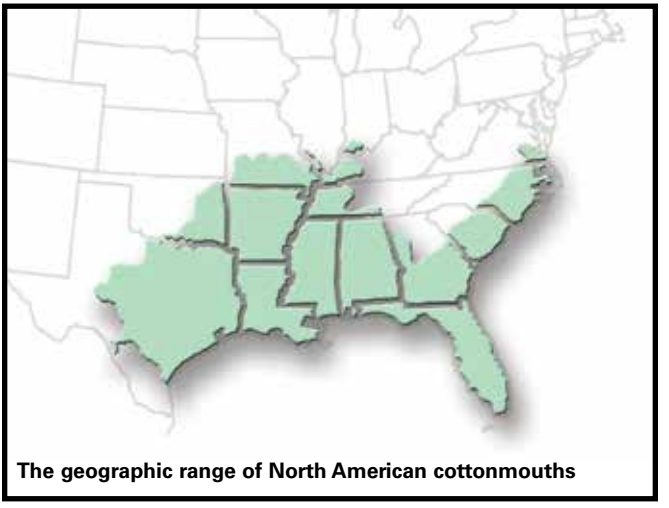
COTTONMOUTHS

This semiaquatic snake gets its name from the white lining of the mouth, which it displays when alarmed. The jaws can snap shut as quickly as a steel trap. Unlike most snakes, when a person approaches, cottonmouths might stand their ground instead of speedily retreating. Identification can be difficult because many water snakes, particularly the larger, heavy-bodied ones, strongly resemble cottonmouths, especially if they are coated with mud. If you live within the range of the cottonmouth, be cautious near all semiaquatic snakes until you have learned to recognize them.

Young cottonmouths have bold and distinctive bands and the tip of the tail is bright yellow, like those of baby copperheads. When they grow older, the cottonmouth's patterns become much less prominent and the tip of the tail darkens. Large ones often are uniformly black or dark olive in color.

In some regions, water snakes—including the cottonmouth—are dubbed *water moccasins,* which can imply that all water snakes are venomous. Because of this confusion, harmless water snakes are sometimes killed on sight. Reserve the name cottonmouth for the single venomous species, and call all the others water snakes.

The cottonmouth lives primarily in lowland swamps, ponds, and rivers but also invades nearby woodland or rocky habitats. The average length of a cottonmouth is 30 to 48 inches.



The geographic range of North American cottonmouths

The geographic range of North American coral snakes

Coral Snakes

Coral snakes belong to the cobra family and, like their hooded relatives, are potentially very dangerous. Fortunately, they are elusive, small, and seldom seen.

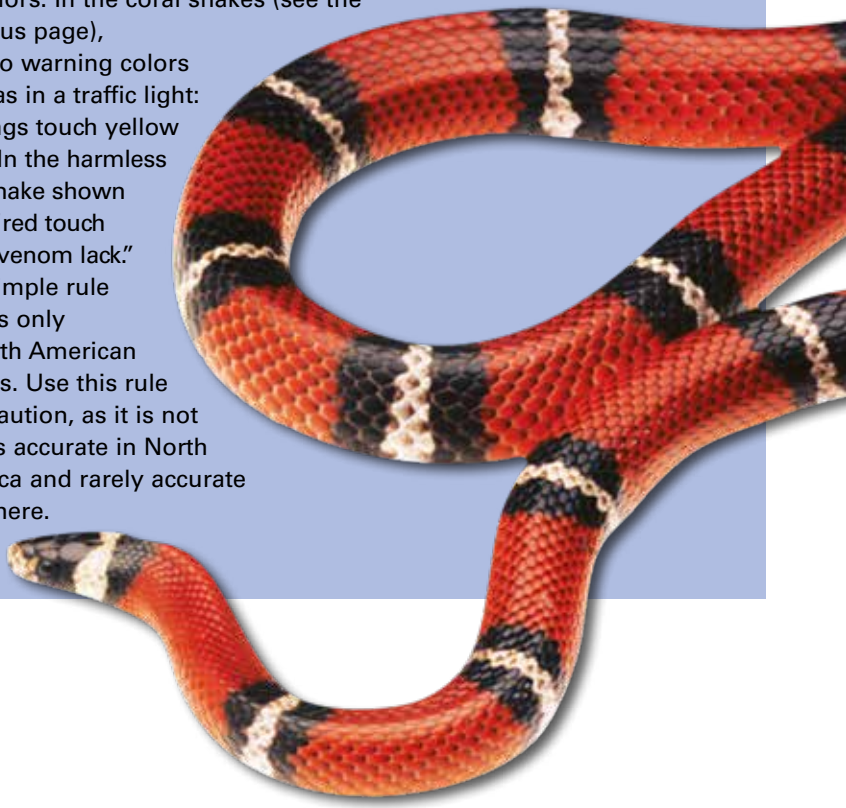
Coral snakes are brightly colored with rings of red, black, and yellow (often cream-colored or whitish in the western species). They could be recognized on sight were it not for the fact that several kinds of harmless snakes look very much like them. Among the mimics are the scarlet snake, the scarlet king snake, and some of the other king and milk snakes.

Coral snakes of the United States belong to two different genera that are separated geographically. The eastern species ranges from North Carolina to Texas, while the western species is found in southwest New Mexico, Arizona, and northwest Mexico.

A cousin of the king and milk snakes, the Texas longnose snake is a harmless mimic of the venomous coral snakes.

The California mountain king snake has a patch range from southern Washington to Baja California. On this harmless coral snake mimic, the red bands touch the black bands.

To distinguish venomous North American coral snakes from harmless species, look at the arrangement of the colors. In the coral snakes (see the previous page), the two warning colors meet as in a traffic light: red rings touch yellow ones. In the harmless milk snake shown here, "red touch black, venom lack." This simple rule applies only to North American species. Use this rule with caution, as it is not always accurate in North America and rarely accurate elsewhere.



Venomous Lizards

The Gila monster (pronounced *HEEla*) and the Mexican beaded lizard are the world's only two venomous lizards. They are closely related and look much alike. Only the fat-tailed, orange to pink-and-black Gila monster occurs in the United States.

The only venomous North American lizard, the Gila monster is found primarily in Arizona. It also can be found in portions of the adjacent states and ranges far southward into Sonora in Mexico. Its average length is 15 to 20 inches.

When it bites, the Gila monster hangs on like a bulldog, and venom flows into the wound from glands in the floor of the mouth. The Gila monster can be a dangerous animal when handled and should be treated with the same caution as a venomous snake.

The geographic range of the Gila monster

Rear-Fanged Snakes

Many North American snakes have fangs in the rear of the mouth and weak venom produced in glands called "Duvernoy's glands." Such snakes will seize a frog or lizard, swallow it far enough for the fangs to reach it, and then wait for the venom to take effect before swallowing completely. Among the rear-fanged snakes are the cat-eyed snake of southern Texas, several kinds of lyre snakes of the Southwest, garter snakes, hognose snakes, water snakes, ring-necked snakes, and several others, nationwide. Such snakes are normally classified as "non-venomous" and are not dangerous, although a few that live in the tropics, such as the boomslang of Africa, are deadly.

Fangs

All snakes have teeth, but pit vipers and coral snakes have hollow *fangs* in the front part of the mouth. Coral snakes have short, permanently erect fangs, while pit vipers have proportionately longer fangs that swing back against the roof of the mouth when the mouth is closed. Usually there is only one fang per side. Sometimes two may be apparent on one or both sides when new fangs are growing in.

Fangs normally are shed at regular intervals, a new fang dropping down alongside the functional one just before the latter is lost. Dissection of the skull of a venomous snake will show a series of fangs ready to grow into place, each fang in turn smaller than the one that lies ahead of it.

A rattlesnake skull shows numerous reserve fangs. When something happens to the function of a fang, another one is ready to drop into its place. A rattlesnake's fangs lie in the forward part of the mouth, where they can be brought into play instantly.

The tip of each fang is needle-sharp and can penetrate leather and flesh with little difficulty. Near the fang tip is an opening through which the venom is injected into the victim. The base of each fang connects with a tubelike duct that leads directly from the venom-secreting glands (right and left) located at the back of the head.

A snake can strike several times in succession, injecting venom each time.

As a precaution, use a hiking stick to poke among stones and brush ahead of you when you walk through areas where snakes are common. Watch where you put your hands as you collect firewood or climb over rocks and logs.

When a snake bites, it opens its mouth, raises its fangs, and darts its head forward. After biting a person or other large animal it withdraws immediately. The entire movement is so rapid it takes a high-speed camera to record it. At the moment the fangs penetrate, the snake's head muscles are pressing on the glands, forcing venom through the ducts and fangs into the victim's body. If the snake misses in striking, venom can be ejected from the fangs for a short distance.

Venom

Snake venoms are liquid proteins. No two species of snake have exactly the same type, but all individuals of a given species have similar venom. Some snakes' venom is amber in color; in others it is clear. Some venoms attack the nervous tissues of the victim; others affect the blood system.

Once absorbed by the victim, the venom works rapidly. Small animals may die in less than a minute. In large animals, such as human beings, the venom may take effect more slowly, and an amount that would kill a small person might not be fatal to a large one. The severity of a bite involves other factors, too, including its location on the body, the physical condition of the victim, and whether the snake actually delivered a full dose of venom. Venomous snakes have been known to bite without injecting venom.

A young cottonmouth has a pattern similar to the closely related copperhead. Even newborn pit vipers are able to bite and inject venom and should be treated with caution.

First Aid for a Snakebite

The bite of a nonvenomous snake causes only minor puncture wounds and can be treated as such. Scrub the bite with soap and water, treat with an antiseptic, and cover with a sterile bandage. However, a venomous snakebite requires special care.

The venomous snakes of North America are pit vipers and coral snakes. Pit vipers, including rattlesnakes, copperheads, and cottonmouths, have triangular-shaped heads with pits on each side in front of their eyes. Signals of a pit viper bite include puncture marks, pain (perhaps extreme) and swelling (possibly severe), skin discoloration, nausea and vomiting, shallow breathing, blurred vision, and shock.

Coral snakes have black noses and are marked with red and yellow bands side-by-side, separated by bands of black. They inject a powerful venom that affects the victim's nervous system. The signals of a coral snakebite include slowed physical and mental reactions, sleepiness, nausea, shortness of breath, convulsions, shock, and coma.

The bite of a venomous snake can cause sharp, burning pain. The area around the bite might swell and become discolored; however, a venomous snake does not inject venom every time it bites. Here are the steps for treating the bite of venomous snakes.

Step 1—Call 911. Get the victim under medical care as soon as possible so that physicians can neutralize the venom.

Step 2—Remove rings and other jewelry that might cause problems if the area around the bite swells.

Step 3—If the victim must wait for medical attention to arrive, wash the wound. If it is a bite of a coral snake, wrap the area snugly (but comfortably) with an elastic roller bandage.

Step 4—Have the victim lie down, and position the bitten part lower than the rest of the body. The victim might be very frightened, so encourage calmness with assurances that care is being provided.

Step 5—Treat for shock.

Do not make any cuts on or apply suction to the bite. Do not apply a tourniquet or use electric shock such as from a car battery. These methods could cause more harm to the victim or are not proven to be effective.

Since snakes are not warm-blooded, they cannot carry rabies.

Do not give a snakebite victim alcohol, sedatives, or aspirin. Do not apply ice to the snakebite. Ice will not help the injury but could damage the skin and tissue.

Observing at a Zoo or Nature Center

If you elect to study a reptile or amphibian at a local zoo or nature center to fulfill requirement 8b, the local public library should be able to help you locate these places. For zoos and aquariums, you also can check with the American Zoo and Aquarium Association.

For your three-month study period, make sure you keep the same specimen under observation, and try to select an individual that can be expected to undergo some kind of change—for example, an immature amphibian approaching metamorphosis, a snake preparing to shed its skin, or a female preparing to give birth. A keeper or curator can help you choose an appropriate subject for the study.

Field Trips and Talks

Taking field trips and giving a talk on reptiles and amphibians makes earning the Reptile and Amphibian Study merit badge even more fun and rewarding. Here are some pointers on how to get started.

Hearing Frogs and Toads in the Outdoors

Hearing frogs and toads calling means getting into the country at night. These amphibians call from ponds, puddles, roadside ditches, swamps, and stream edges, usually where the water is shallow and near where their eggs will be laid. In the northern states, the choruses begin when the first warm rain arrives in early spring. In the South, some species sing during the winter. In most areas, some species call during spring and summer. In the arid West, sudden rainstorms start them calling.

Not all species of frogs and toads sing at once. In the Northeast, for example, spring peepers, chorus frogs, and wood frogs are the first to be heard. They soon are followed by the leopard and pickerel frogs, and American toads. Cricket frogs and treefrogs usually sing later, and Fowler's toads and bullfrogs may be the last to join the choruses. Weather plays a big part. A warm, wet early spring may stimulate many species to call at the same time. Later, a rain may set them off out of season when a few males call briefly, long after the breeding time is over.

The red-eyed tree frog is an arboreal species from Central America.

Some frogs sing near shore, but others do not. Waders or hip boots may be the most comfortable cold-weather wear if you plan to wade into the water. If the waters are not too cold, you may prefer leather boots or canvas sneakers.

Always take a bright flashlight and fresh batteries, and put a small backup flashlight in your pocket in case the main one goes out while you are in the middle of a swamp. Also, you must always get the landowner's or land manager's permission before you start exploring.

Only male frogs call. During their first enthusiasm they may sing day and night. After a day or two the choruses usually are heard only after dark. It is well to venture out at dusk and listen as you hike or drive along a road that runs through a swamp, or in an area where there are ponds and puddles. Once you locate a chorus, approach slowly and quietly; otherwise the frogs will be alarmed and dive into the water, and you may not see or hear them again all evening. It is normal for them to stop calling when you get near. When that happens put out your light and stand perfectly still until they start again. If you are good at imitating their calls, they may respond to you promptly. Then stalk slowly forward again, and repeat the procedure until you are close enough to make your observations.

In arid country, sudden rainstorms may bring toads out in enormous numbers. They call vigorously for a night or two and then disappear. Under these conditions you had better go frogging at once and not wait for another night.

Bullfrogs can grow as big as 6 inches long and, not surprisingly, have big appetites.

Observing Frog and Toad Calls

There are many things to observe. Is the frog in a bush or on a tree? Is it at the water's edge? Is it floating at the surface? How does it make its call? Frogs and toads have throat sacs that inflate when they sing, serving as resonance chambers. Is there a single, bubblelike sac, as in the case of many toads? Or is it elongated like a sausage? Many frogs have a pair of vocal sacs, one at each side of the throat. You should note all these details.

Imitating the calls will take practice. Getting them right can depend on how clever you are with your voice. Whistling like a spring peeper is easy. A chorus frog call can be simulated by running a finger slowly along a comb, touching the smallest teeth last. Once you have heard the songs, you can invent ways to imitate them.

Join a local FrogWatch USA chapter to help as a citizen scientist by monitoring one or more local wetland sites to identify local frog and toad species by their breeding calls, and accurately report your findings.

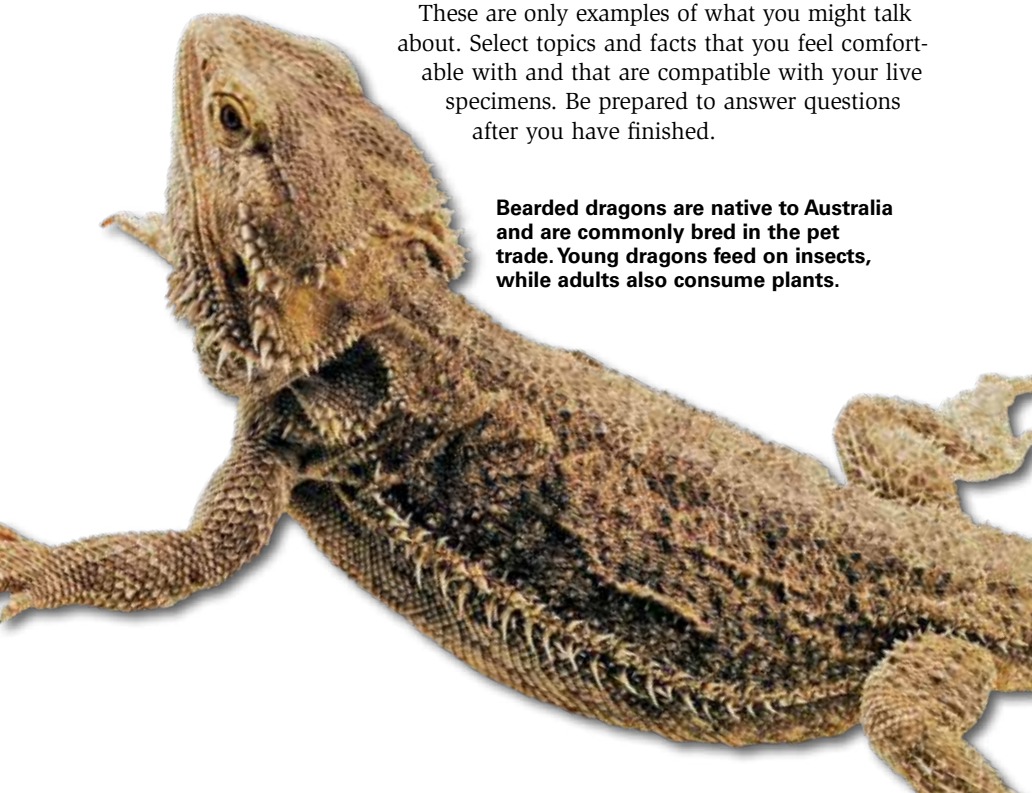
Male frogs like this tree frog use their vocal sacs to amplify their calls and attract females to the breeding pond.

Giving a Talk on Reptiles and Amphibians

The secret of success is to prepare your talk in advance. Make an outline of what you want to say. Remember that the people in your audience probably will know little about these animals. Explain the differences between a reptile and an amphibian and use live specimens or pictures to illustrate important points.

You will need to spend some time studying books on reptiles and amphibians so that you know more about the subject than your audience does. The resources section in the back of this pamphlet lists a great variety of resources. Learn the answers to such questions as how a snake crawls, why it sticks out its tongue while you hold it, and why it has no eyelids. Explain the difference between a land or box turtle and the aquatic kinds, pointing out the webbed feet of the latter. Tell your audience why many kinds of lizards have tails that break off readily, or why turtle shells of different species vary in shape and color. Explain the development of frogs and toads from egg to tadpole to adult. Tell them what you find most exciting about reptiles and amphibians or about your observations of species in captivity or in the wild.

These are only examples of what you might talk about. Select topics and facts that you feel comfortable with and that are compatible with your live specimens. Be prepared to answer questions after you have finished.



Bearded dragons are native to Australia and are commonly bred in the pet trade. Young dragons feed on insects, while adults also consume plants.

The ornate horned frog is a well-camouflaged terrestrial (land) species from the Amazon Basin region.

Facts and Superstitions

Put that toad down or you'll get warts! Don't get too close to a snake or it will chase you! And keep your mouth closed around salamanders because they will jump in if you're not careful!

These and other legends like them are some of the wild tales that have been told about reptiles and amphibians over the years. Although a few of these folktales have some factual basis, most of them are just plain yarns spun for effect.

When it comes to snakes, some folks are willing to swallow the most fantastic myths. While snakes do some amazing things, there probably are more tall tales told about snakes than any other animals. Here are some:

- A hoop snake rolls down hills with its tail in its mouth and has a venomous stinger in its tail.
- Snakes that live around barns milk cows.
- Snakes swallow their young to protect them.
- The whip snake will chase a person down, wrap around him, and thrash him to death.
- Snakes chase people.
- Snakes are slimy.
- Snakes go blind during the dog days of August.
- When a snake is killed, its tail wriggles until sundown.
- If a snake is cut into pieces, each piece will form a new snake.
- Snakes are charmed by music.
- Snakes travel in pairs and seek revenge if one is killed.
- Snakes hypnotize their prey.
- A rattlesnake adds a new rattle each year of its life.

And while not as plentiful as the tales told about snakes, superstitions about amphibians are just as interesting:

- Toads give people warts.
- Salamanders like fires.
- Tree frogs predict rain.
- Frogs and toads rain down from the sky.
- Salamanders poison springs and jump into people's mouths.

None of the above statements is true, and some obviously are absurd. But unless one is familiar with the facts about reptiles and amphibians, some are believable. See if you can add to the list of superstitions and false beliefs by talking to people in your area, and see if you can determine what the facts are that may have led to the misconception.

Stranger Than Fiction

Here are the facts behind some of the misconceptions mentioned above:

Rat snakes eat many rats and mice, and barns and other farm buildings often are excellent places to find food. So finding snakes around dairy farms is to be expected. But the rat snake's mouth is full of needle-sharp teeth for holding small animals and is not equipped for sucking milk from a cow.

Many serpents, such as kingsnakes and racers, eat other snakes—sometimes even their own kind. So if a person happened to come along at the right moment, it would be easy to jump to the conclusion that a mother snake was trying to protect her offspring. The illusion would be strengthened if the larger snake was disturbed and disgorged the smaller one, enabling it to escape.

The eastern coachwhip is one of the longest snakes in North America, reaching lengths of more than 7 feet. The tail somewhat resembles a braided bullwhip. This may be the source of the story about a snake that whips people.

No snakes in North America are habitually aggressive toward human beings, and none is known to chase people. It is more correct to say that a animal's behavior is defensive, rather than aggressive, because in most cases animals are attempting to defend themselves by striking or other quick movements that may be misinterpreted as aggression.

A few, like the big diamondback rattlers and the cottonmouth, will sometimes stand their ground, and occasionally a snake will strike out if harassed. But the average snake, given a fair chance to escape, will speedily get out of a person's way. Sometimes during the mating season racers and other snakes may feign an attack. Or, in order to reach their shelters, snakes may crawl directly toward persons who happen to be in the way.

No snakes are naturally slimy. If they have just crawled from the water, they may look that way. Some kinds are so shiny and iridescent they appear oily. To the touch, however, snakes feel much like soft, pliable leather.

When a snake has met a violent death, reflex action often lasts quite a while afterward, and the tail can wriggle for some time. But sundown plays no part in it.

Snakes do not have ears or even ear openings and therefore cannot hear the normal airborne sounds, such as music, that humans hear. They feel vibrations through their lower jaw, primarily those transmitted through the ground's surface.

Frogs like this gray tree frog often call on warm, rainy nights but also will call at other times. Far from being good prognosticators, they may call as loudly before good weather as before rain.

Giants of the tortoise world, the Galapagos tortoise can live more than 150 years and grow to hundreds of pounds.

The Importance of Conservation

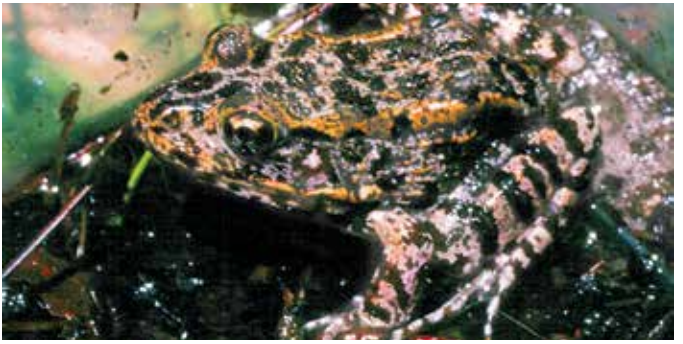
Reptiles and amphibians have taken a frightful beating over the years. Snakes have been stoned or clubbed to death. Basking turtles have been used for target practice by people with rifles, as have lizards and frogs by children with slingshots. All kinds of reptiles and amphibians have been killed for no good reason. Fortunately, attitudes about protecting reptiles and amphibians are changing.

Most people now recognize that reptiles and amphibians serve an important environmental role. They prey upon other animals, including great quantities of mice, rats, and insects, and are in turn eaten by predators such as hawks, carnivorous mammals, and other reptiles. They are important links in the food chain of other native wildlife.

Remember, *extinction* is forever, but *endangered* means there is still time if we care enough to act quickly.

Our state and national park systems and the efforts of many private groups are evidence of our attempt to preserve wildlife communities. But the pressure of a growing population makes it increasingly difficult to keep these areas natural.

You can find out what plants and animals are protected in your state by contacting your state's parks and wildlife department, or by visiting the U.S. Fish and Wildlife Service website. See the resources section in this pamphlet.



Many species of reptiles and amphibians, such as the closely related gopher frog and crawfish frog, occur in isolated populations over a wide geographic area. The destruction of small wetland habitats threatens the survival of such species.

A deadly enemy of reptiles and amphibians today is habitat destruction. When we drain or fill bogs, swamps, and other wetlands for industrial sites, shopping centers, and housing developments, we destroy the habitats of future generations of frogs, salamanders, snakes, and turtles. Destructive lumbering and atmospheric pollution can contribute to the reduction of many species' forest homes. Pollution in our streams can make the water unsuitable for amphibians or aquatic reptiles. When we spray our fields, forests, and roadsides with chemicals that are deadly to reptiles and amphibians, we may be affecting an important part of the ecosystem.

The handsome, sturdy-looking wood turtle is a vanishing semiaquatic species native to riparian areas of the Northeast.

Another form of destruction comes from the pet trade. No harm is done by keeping a turtle, frog, or harmless snake as a pet, provided the animal receives good care and attention. But native animals should not be collected from the wild to be kept as pets. For some species, collection of even one or two individuals can lead to the collapse of the local population. But enormous numbers of pets die needlessly every year through ignorance and carelessness. Most people have little or no knowledge of how to care for such pets, many of which are purchased as novelties or on impulse.

Loss of much of its specialized wetland habitat to development, combined with illegal collection for pets, has made the small, rare, and secretive bog turtle a federally endangered species.

Hundreds of thousands of live reptiles and amphibians are imported legally into the United States each year, largely for the pet trade. Many more than that are believed to be imported illegally. They are handled in such large quantities by some dealers that individual care is impossible. Many die in shipment, or in the hands of owners who do not know how to care for them or who simply don't care. The drain on native species by unscrupulous collectors is also severe, causing many species of native reptiles and amphibians to receive protection from certain states, as well as from the federal government.

You can help to protect reptiles and amphibians by bearing the following rules in mind:

1. Never collect wild specimens, unless specially permitted by your state's wildlife agency for research or education purposes.

2. When you overturn logs or rocks or boards while looking for snakes or other specimens, put this cover back in place to serve as shelter for the next animals that come along.

3. Provide proper food, shelter, and water for any animal you keep in captivity, and make sure the temperature in the cage is appropriate for the species.

4. When you are through examining them, release your specimens at the same spot where you caught them. You aren't helping by turning it loose in a strange environment where it has little or no chance to survive.

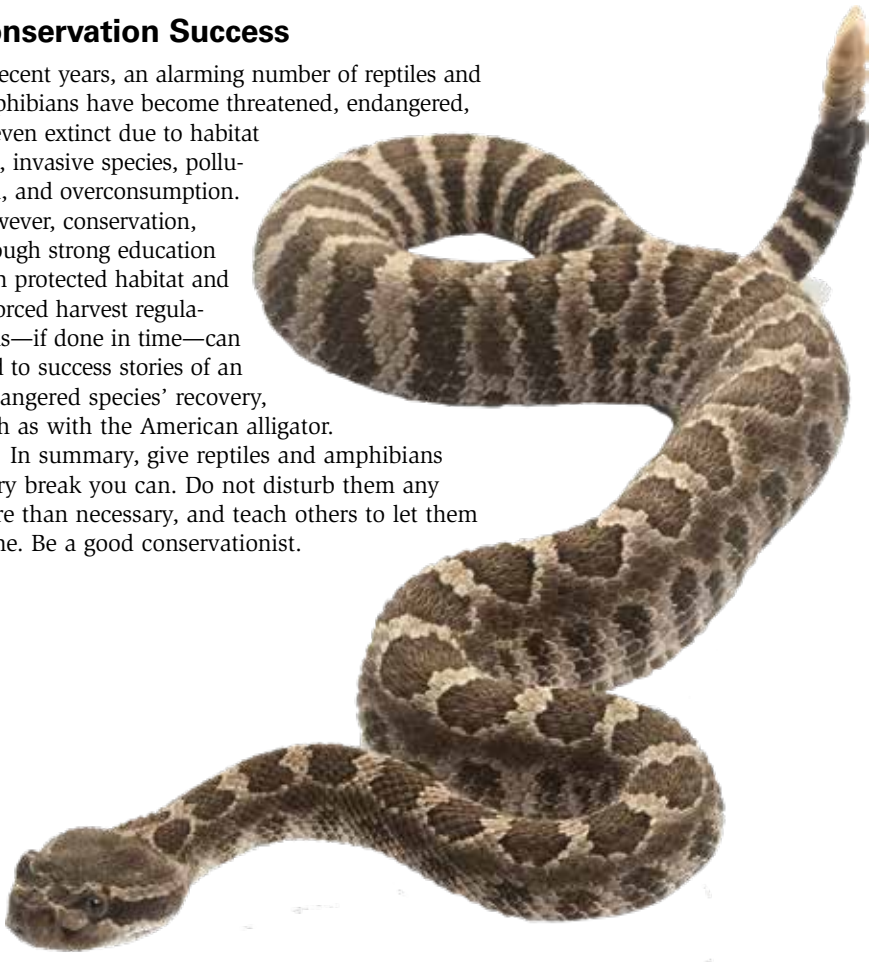
5. Teach your fellow Scouts, family, friends, and acquaintances by telling them repeatedly that reptiles and amphibians are an important component of our natural heritage and should be protected. Even venomous species should be treated with respect and safely moved by trained adults when necessary. They deserve our protection in their natural habitats, which may overlap with our campsites, houses, etc. that we have built in their territories.

Aquatic turtles are well-streamlined for swimming.

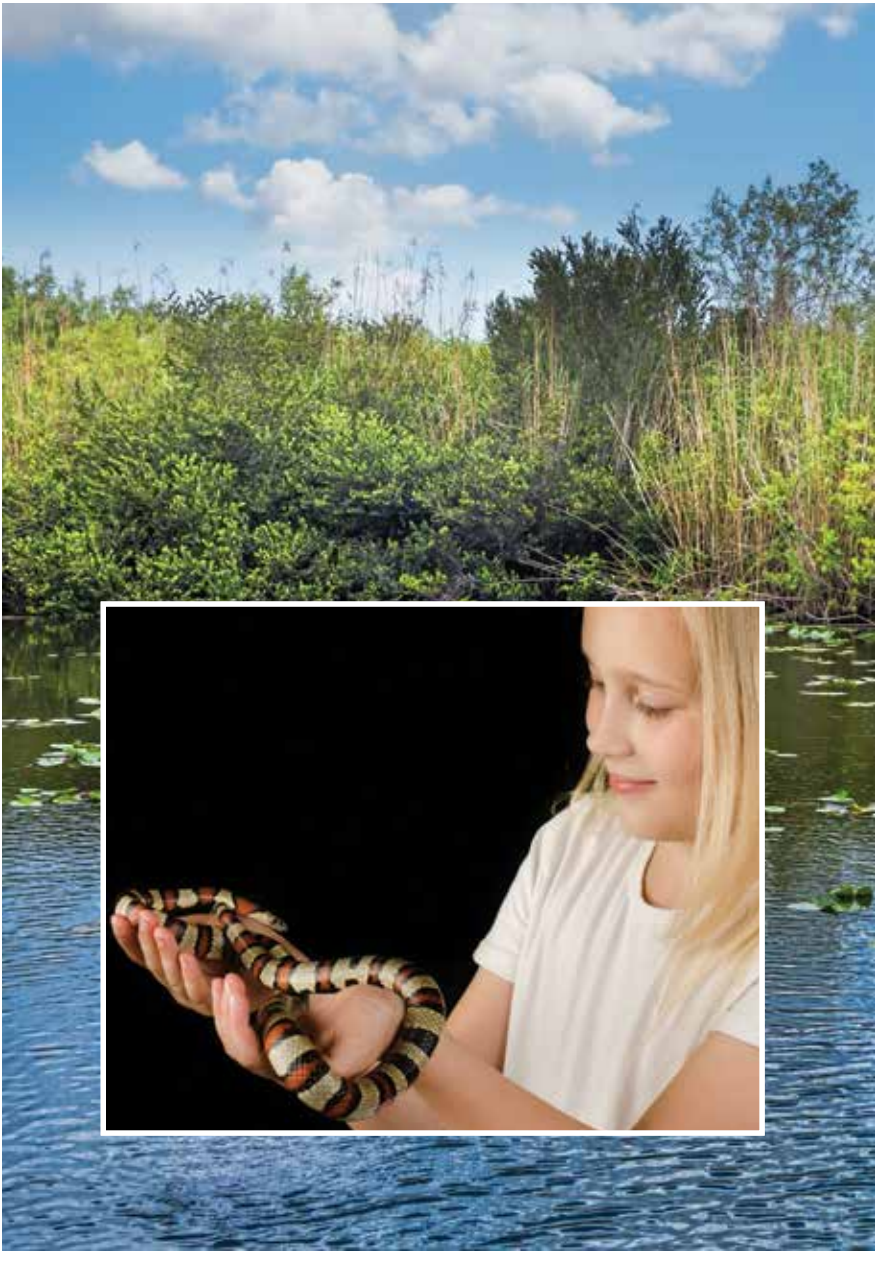
Conservation Success

In recent years, an alarming number of reptiles and amphibians have become threatened, endangered, or even extinct due to habitat loss, invasive species, pollution, and overconsumption. However, conservation, through strong education with protected habitat and enforced harvest regulations—if done in time—can lead to success stories of an endangered species' recovery, such as with the American alligator.

In summary, give reptiles and amphibians every break you can. Do not disturb them any more than necessary, and teach others to let them alone. Be a good conservationist.



The rattlesnake uses the heat-sensing pits on its snout to find warm-blooded prey at night.



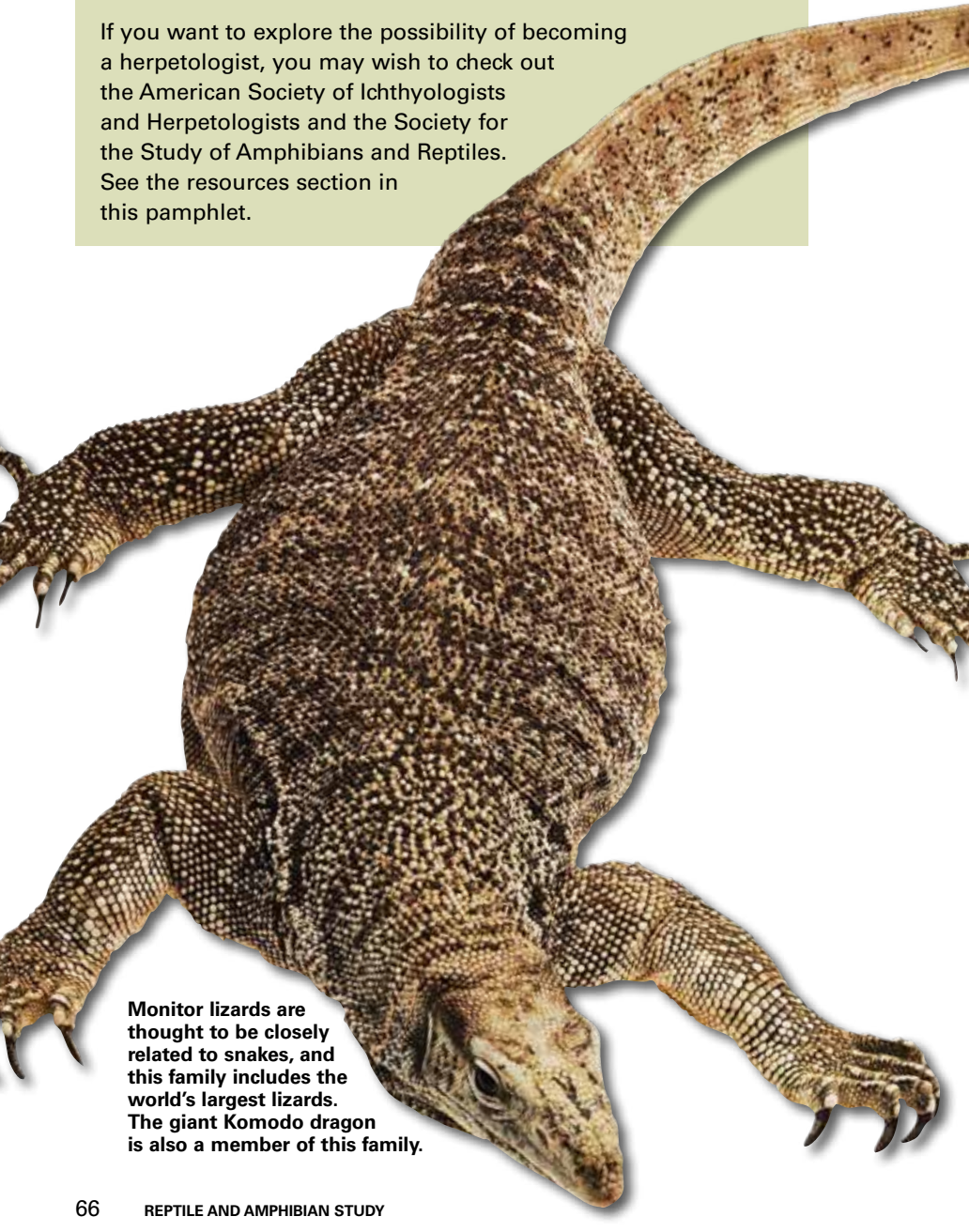
The Professional Herpetologist

Herpetology makes a fascinating hobby. It can provide healthy outdoor exercise and a sense of adventure if you have access to a wild or suburban area and have permission to observe or collect specimens. Indoors, it is fun to maintain a cage or terrarium. Feeding and caring for them, watching their behavior, and having a chance to make observations of possible scientific value—either at home or in the field—are fun.

Becoming a professional herpetologist is a more serious endeavor, and the career opportunities are limited. Most professionals have college training in the field of biology. Many biology teachers in colleges and universities devote their research time to the study of reptiles and amphibians. Some zoos and museums employ curators of amphibians and reptiles. However, no matter how great your training and enthusiasm, you might have to wait for an opening to develop in any of these professions.

Most adults who are interested in herpetology earn their living in other ways. They have careers not necessarily related to science but use their spare time in pursuit of a side career in herpetology. Many regions of the country have herpetological societies that serve as excellent opportunities for amateur and professional herpetologists to meet.

If you want to explore the possibility of becoming a herpetologist, you may wish to check out the American Society of Ichthyologists and Herpetologists and the Society for the Study of Amphibians and Reptiles. See the resources section in this pamphlet.



Monitor lizards are thought to be closely related to snakes, and this family includes the world's largest lizards. The giant Komodo dragon is also a member of this family.

Reptile and Amphibian Study Resources

Scouting Literature

Reptiles and Amphibians pocket guide; *Bird Study, Fish and Wildlife Management, Fishing, Fly-Fishing, Hiking, Insect Study, Mammal Study,* and *Nature* merit badge pamphlets

With your parent's permission, visit the Boy Scouts of America's official retail website, www.scoutshop.org, for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Field Guides to North American Reptiles and Amphibians

Behler, John L., and F. Wayne King. *The Audubon Society Field Guide to North American Reptiles and Amphibians.* Knopf, 1988.

Conant, Roger, and Joseph T. Collins. *A Field Guide to Reptiles and Amphibians of Eastern and Central North America,* 4th ed. Houghton Mifflin, 1998.

Smith, Hobart M., and Edmund D. Brodie Jr. *A Guide to Field Identification: Reptiles of North America.* Golden Guides from St. Martin's Press, 2014.

Stebbins, Robert C. *A Field Guide to Western Reptiles and Amphibians,* 3rd ed. Houghton Mifflin, 2003.

Tyning, Thomas F. *Stokes Guide to Amphibians and Reptiles.* Little, Brown, 1990.

Natural History Guides

Ernst, Carl H. *Venomous Reptiles of the United States, Canada, and Northern Mexico: Crotalus (Volume 2).* Johns Hopkins University Press, 2011.

Ernst, Carl H., and Roger W. Barbour. *Snakes of Eastern North America.* George Mason University, 1989.

Ernst, Carl H., Roger W. Barbour, and Jeffery E. Lovich. *Turtles of the United States and Canada,* 2nd ed. Smithsonian, 2009.

Greene, Harry W. *Snakes: The Evolution of Mystery in Nature.* University of California Press, 2000.

Hofrichter, Robert. *Amphibians: The World of Frogs, Toads, Salamanders and Newts.* Firefly Books, 2000.

Petranka, James W. *Salamanders of the United States and Canada.* Smithsonian, 2010.

Ross, Charles A. *Crocodiles and Alligators.* Facts on File, 1989.

Zug, George R., Carl H. Ernst, et al. *Smithsonian Answer Book: Snakes,* 2nd ed. Smithsonian Books, 2015.

Caring for Reptiles and Amphibians in Captivity

Bartlett, R.D. *The 25 Best Reptile and Amphibian Pets.* Barron's Educational Series, 2006.

Frye, Fredric L. *A Practical Guide for Feeding Captive Reptiles.* Krieger Publishing, 1991.

Mattison, Christopher. *The Care of Reptiles and Amphibians in Captivity.* Blandford Press, 1987.

Rossi, John V. *Snakes of the United States and Canada: Keeping Them Healthy in Captivity.* Krieger, 1992.

Sounds of Frogs and Toads

These are records or tapes of the calls of a great many of our native frogs and toads.

Bogert, Charles M. *Sounds of North American Frogs: The Biological Significance of Voice in Frogs.* CD or download. Smithsonian Folkways Recordings, 1998. www.folkways.si.edu.

Elliott, Lang. *The Frogs and Toads of North America: A Comprehensive Guide to Their Identification, Behavior, and Calls.* Book and CD. Houghton Mifflin Harcourt, 2009.

Kellogg, Peter P., and Arthur A. Allen. *Voices of the Night.* CD. Library of Natural Sounds, 1982. Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850. www.birds.cornell.edu.

Organizations and Websites

American Museum of Natural History
Central Park West at 79th Street
New York, NY 10024-5192
www.amnh.org

American Society of Ichthyologists and Herpetologists
www.asih.org/jobs

AZA FrogWatch USA Program
Association of Zoos and Aquariums
8403 Colesville Road, Suite 710
Silver Spring, MD 20910
www.aza.org/frogwatch

National Fish and Wildlife Foundation
1133 15th St. NW, Suite 1100
Washington, DC 20005
www.nfwf.org

National Geographic Society
P.O. Box 98199
Washington, DC 20090-8199
www.nationalgeographic.com

National Wildlife Federation
11100 Wildlife Center Drive
Reston, VA 20190
www.nwf.org

North American Amphibian Monitoring Program
www.pwrc.usgs.gov/naamp

Smithsonian National Zoological Park
nationalzoo.si.edu

Society for the Study of Amphibians and Reptiles
www.ssarherps.org

U.S. Fish and Wildlife Service
1849 C St., NW
Washington, DC 20240
www.fws.gov

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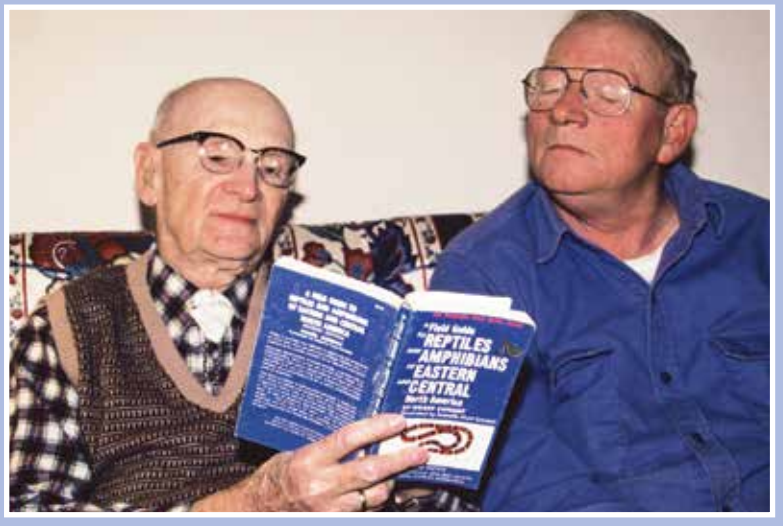

Dr. Roger Conant (1909–2003)

This *Reptile and Amphibian Study* merit badge pamphlet is dedicated in memory of Dr. Roger Conant, former director of the Philadelphia Zoo and author of numerous herpetology publications, including the first edition of this book. (He is pictured here with his son, Skip, *right,* also an avid naturalist.)

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