



# Introduction to the Snakes of Oklahoma

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Forty-six species of snakes are native to Oklahoma. Only seven species (15%) are potentially harmful to humans. Venomous species include the copperhead, cottonmouth, western diamondback rattlesnake, timber rattlesnake, prairie rattlesnake, western massasauga, and western pigmy rattlesnake. Snakes are found statewide and in all habitats. Some species thrive in urban and suburban environments. Given the large number of snake species, both venomous and nonvenomous, it is important that Oklahomans learn to identify the species and learn more about this unique part of our state's fauna. This fact sheet will introduce you to the biology of some of the snakes of Oklahoma and will provide a list of all known species in the state.

Snakes, lizards, turtles, and crocodiles form the group of animals known as reptiles. Reptiles are best known for having scales and/or bony plates and laying terrestrial eggs. Contrary to popular belief, snakes are not slimy, although the smooth, highly polished scales found on species such as the king snake may suggest this appearance. Other snakes have a ridge that runs down the length of each scale, giving the snake a duller, rougher look.

Many reptiles are unable to maintain a constant body temperature and are often called "cold-blooded." Biologists now prefer the term ectothermic. An ectotherm's body temperature changes with that of its environment; snakes in the shade tend to have a lower body temperature than snakes found in open sunlight. Each species has a preferred body temperature that individuals attempt to maintain behaviorally. On cool mornings snakes often bask in the sun or warm themselves on rocks.

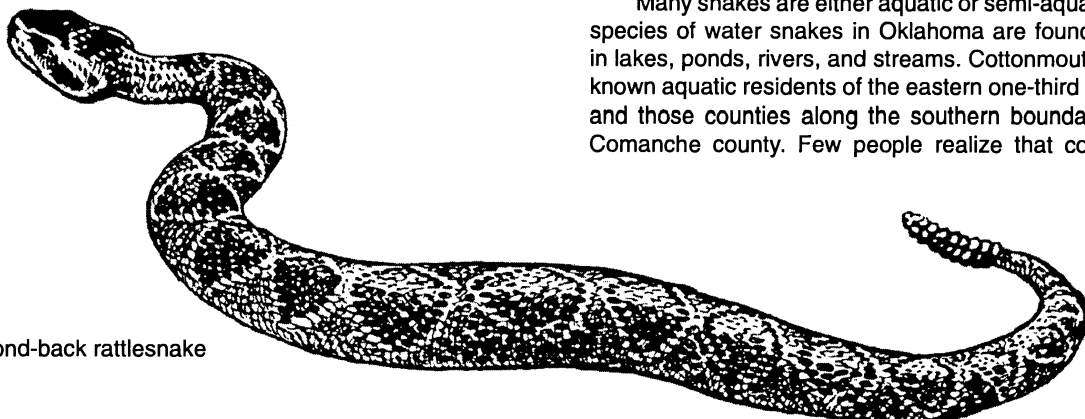
At night they may crawl onto highways where they absorb heat before searching for food. To avoid overheating during the hottest months many snakes become inactive during the day and come out at night. At low temperatures (below 60°F) snakes become sluggish, and a continued drop in temperature (below 56°F) initiates hibernation.

## Habitat

Snakes are found in a wide variety of habitats. Most snakes are terrestrial (land-dwelling). Some terrestrial species require specific habitats. Eastern and western hognose snakes prefer loose, sandy soils for burrowing. Bull snakes are common on prairies, but they also occur in sparsely to heavily wooded areas. Other snakes, such as rat snakes, show less habitat preference. One sub-group of terrestrial snakes is fossorial (they live mostly underground). An example is the blind snake. These small snakes are frequently mistaken for earthworms due to their color and tiny, non-functional eyes. Blind snakes are occasionally found above ground after heavy rains or in freshly plowed fields.

The rough green snake is the only species of snake in the United States that regularly lives in trees. Rough green snakes are excellent climbers and their color pattern—green back and yellowish belly—provides useful camouflage. Other snakes can climb trees, and some individuals, especially rat snakes, climb regularly in search of food and shelter. Water snakes, and occasionally cottonmouths, bask in the sun in trees and bushes that overhang streams. When disturbed, they drop off into the safety of the water. This can provide a surprise for an unsuspecting canoeist resting in the bankside shade.

Many snakes are either aquatic or semi-aquatic. The six species of water snakes in Oklahoma are found statewide in lakes, ponds, rivers, and streams. Cottonmouths are well known aquatic residents of the eastern one-third of the state and those counties along the southern boundary, west to Comanche county. Few people realize that copperheads



Diamond-back rattlesnake

can also be aquatic. While garter snakes are considered to be terrestrial, they frequently enter the water to feed on minnows and amphibians. In western Oklahoma, certain species of garter snakes are found only near some permanent water source. Possibly the most interesting aquatic snake is the mud snake, found in swampy areas in southeastern Oklahoma. Mud snakes often lie loosely coiled under rocks and fallen trees. This habit may well have given rise to the fable of the "hoop snake," the snake that bites its tail and rolls around like a hoop. Mud snakes are also responsible for the fabled "stinging snake myth." With jabs of the horny-tipped tail, mud snakes maneuver large prey such as aquatic salamanders into position for eating. The mud snake uses this horny tip in the same way to startle intruders.

Poisonous snakes are found throughout the state. Cottonmouths, copperheads, massasaugas, and pigmy rattlesnakes are usually found in moist environments. Prairie rattlesnakes are found in the prairies of western Oklahoma, while timber rattlesnakes inhabit the forested eastern half of the state. Western diamondback rattlesnakes are most common in southern and western Oklahoma, but their range extends as far north as Tulsa, Cherokee, and Adair Counties. Rocky outcrops providing shelter, basking, and possible hibernation sites are a favorite habitat for copperheads and rattlesnakes. Where rocky outcrops are scarce, many different species of snakes often share dens for hibernating.

The local dump is one habitat not often considered. Exposed trash and litter provide refuge for bottle snakes and the small animals that snakes use as food. Snake populations can be controlled around homes by simply removing tall weeds, brush, rubbish, etc., that provide potential cover. In an effort to attract snakes for study, biologists will often "seed" an area with large plywood or tin pieces, thus providing the cover essential to snake survival.

## Food Habits

All snakes are carnivorous. Most small species of snakes eat invertebrates. Ringneck snakes, brown snakes, worm snakes, and others prefer earthworms, beetles, and insect larvae. Rotting stumps with termite colonies are a favorite dining place for central lined snakes. Rough green snakes consume grasshoppers, moths, and caterpillars.

Fish, amphibians, and aquatic invertebrates make up the diet of most water snakes. An exception to this rule, Graham's water snake consumes large numbers of crayfish. A common question is, can a cottonmouth bite underwater? Since a cottonmouth's diet consists mainly of fish and amphibians, the answer is a resounding yes! Hognose snakes eat toads, frogs, and lizards, and this may be a clue regarding the recent decline in hognose numbers. Increased pesticide use may adversely affect the hog nose's main food sources, toads, or may have directly or indirectly reduced the hognose population.

Small mammals and birds make up the diet of most larger snakes. Rat snakes, bullsnakes, racers, coachwhips, and rattlesnakes eat birds and small mammals in varying degrees. Adult diet may be influenced by individual experience; a snake that learns, as a juvenile, to eat small mammals or birds often continues to do so throughout life.

Many snakes, including whip snakes; racers; cottonmouths; garter snakes; and kingsnakes, eat snakes. Of these

snake eaters, kingsnakes are the most notorious. Kingsnakes are especially interesting because they are relatively tolerant (immune) to the venom of our native poisonous snakes. Rattlesnakes recognize kingsnakes and make no effort to bite them. Instead, they attempt to repel hungry kingsnakes by "throwing" loops of their bodies at them. Kingsnakes cannot be depended upon to eliminate the poisonous snakes from a given area. They neither selectively eat rattlesnakes nor do they eat large numbers of other snakes. However, kingsnakes, like many other snakes, may be helpful around a home.

Snakes have a highly developed sense of smell that is associated with the tongue. The tips of the tongue capture odor chemicals in the air and transfer them to the paired Jacobson's organs that lie in the roof of the mouth. These organs are very sensitive to odors and help snakes recognize potential food. Eyes of snakes are sensitive to movement. The pit vipers (rattlesnakes, cottonmouths, and copperheads) have an added feature for detecting prey. Between the eye and the nose is a depression, the facial pit, which is a heat sensor. This organ enables a pit viper to detect and strike a nearby warm object with great accuracy, even in the dark. Imagine how useful this system would be for a snake searching for ground squirrels in a burrow. With the use of both eyes and facial pits, pit vipers can differentiate between a warm moving object, such as a squirrel, a cold moving object, such as a leaf, or a hot stationary object, such as a rock.

Once the prey is detected it must be captured and subdued. Prey is captured and held by several rows of sharp teeth that curve toward the back of the mouth. Nonvenomous snakes subdue prey by constriction or suffocation. Kingsnakes and rat snakes loop themselves around their prey and squeeze. Prey is killed by suffocation or by creating so much pressure that the heart stops beating. Prey is not crushed, as it is popularly believed. Racers and bullsnakes kill prey by pushing against rocks, walls, or the ground. Another method of killing prey is by the use of venoms. Venoms produced by the pit vipers serve to kill prey, as well as aid in the digestion of prey. As much as an hour may be required for a pit viper to find its prey after the initial bite. During this time the venom breaks down tissue, incidentally preparing it for digestion. Snakes do not normally eat when temperatures are not conducive to rapid digestion.

Snakes have several features that enable them to swallow food that is larger than their bodies. The best-known feature is a lower jaw that is composed of two bones that are connected by a ligament. This ligament allows the jaws to stretch apart and also enables both sides of the jaw to be moved independently of the other. Unlike the skulls of mammals, snakes skulls are made up of bones that are held together by ligaments. Muscles are arranged so that individual bones of the skull can move independently. Thus, a snake can lift the bone containing the teeth of the upper left side of the head, move this bone forward and imbed the teeth in the prey, and draw the prey into the mouth by contracting the muscles that return the bone to its original position. Coordinated movements of the upper and lower jaws move prey into the mouth in a process that looks like the snake is crawling around its prey. Additional features include a throat that is highly elastic to allow passage of large food items and a special "tube" that can be extended from the mouth to provide air when the mouth is filled with large prey.

## Reproduction

There are three ways in which vertebrates can produce offspring: oviparity (egg laying), ovoviviparity (egg retention), and viviparity (placental, similar to man and other mammals). All three methods are found in Oklahoma snakes. Egg laying is probably the most common form of reproduction in snakes. Egg layers include bullsnakes, rat snakes, kingsnakes, racers, coachwhips, and ringneck snakes, to name a few. Reptilian eggs are covered by a tough, leathery shell that is permeable to water. Nest site selection is very important since too much or too little moisture can result in loss of the clutch.

Egg retention is another form of reproduction that is fairly common. Snakes using this method produce a thin, transparent membrane that surrounds the embryo. These "eggs" are retained within the female's body until hatching. Young may hatch while the eggs are still in the female or immediately after the eggs have been "laid." Young produced in this manner probably have a better chance of surviving since the female can help regulate the temperature and moisture content of the developing eggs. Water snakes, cottonmouths, copperheads, and all rattlesnakes are ovoviviparous.

The last mode of reproduction, viviparity, surprises most people. Viviparous animals have placentas that provide a means for the mother to get nourishment to the developing embryo. This is a very effective method for bearing young that might otherwise have low hatching success. Central lined snakes, brown snakes, and garter snakes are all viviparous. Stories of females swallowing their young when threatened and regurgitating them later may have originated when people saw a recently dead viviparous or ovoviviparous female give "birth" to her young.

The number of young produced by a female is a function of the age and size of the female, reproductive experience, and general health. Larger females usually, but not always, produce larger clutches than smaller females. Clutch size in ringneck snakes varies between 1 and 10 eggs per clutch with an average of 5 eggs per clutch. Black rat snakes lay clutches ranging from 5 to 44 eggs per clutch with an average of 12 eggs per clutch.

Brown snakes (9 to 13 inches long) average 14 eggs per clutch, while kingsnakes (36 to 48 inches long) average only 10.1 eggs per clutch. Carter snakes average 12 young per litter, but individuals have given birth to up to 85 young. Copperheads and cottonmouths produce an average of 5 young per litter. The large rattlesnakes produce an average of 10 to 11 young per litter.

Snakes mate in the spring shortly after they emerge from hibernation. Females of some species produce a chemical odor, a pheromone, that attracts males. Pair bonding between snakes is rare, and maternal care is short-lived if present at all. A few species of snakes are capable of producing two clutches each year, but these individuals are exceptional.

Reproduction varies greatly in rattlesnakes. Prairie rattlesnakes appear to reproduce only every other year. Reproduction in other rattlesnakes probably depends on available resources. If resources are available, they may reproduce every year. If resources are limited, they may skip reproduction. Removal of females, especially large females from populations that are not producing every year, might have a serious effect on the local population.

## Snake Bites, Venom, and Poisonous Snakes

The best cure for snakebite is to avoid being bitten. Considerable controversy exists over the "proper" method for treating snakebite, so it is a situation that is best avoided. The best way to avoid snakebite is to learn more about the venomous snakes in your area, where they can be found, what they like, etc. There are several field guides and an excellent state book on reptiles that will help you identify venomous snakes and their habitats. Take proper precautions when traveling in "snake country." Avoid placing your hands or feet blindly. Proper clothing can further reduce the risk of snakebite. Leather high-topped boots are sufficient to stop the fangs of most poisonous snakes. Heavy canvas pants and protective leggings can provide added protection in high-risk areas. Finally, do not wander outside at night without a light or protective covering for legs and feet.

One last precaution is to learn to identify the poisonous snakes in your area. A surprising number of people are bitten each year because they picked up a snake they thought was not poisonous. When in doubt, do not take a chance: Do not pick up any snake that you can not identify. There are four features that can be used to identify poisonous snakes. Presence of rattles on the tail positively identifies a snake as being poisonous. Be certain that the rattles are seen, snakes will vibrate their tails when they are nervous or frightened and contact of the tail with dried leaves or grass produces a sound that can be mistaken for a rattle. Lack of a rattle does not exclude the possibility that a snake is poisonous.

Head shape can help to identify poisonous snakes. Poisonous snakes in North America tend to have diamond or triangular-shaped heads (See Figure 1). Harmless snakes have narrow heads. This characteristic is not always identifiable since snakes flatten their heads when threatened to make themselves look bigger. Thus, nonpoisonous snakes could be mistaken for poisonous ones.

Vertical eye pupils, "cat's eyes," are a strong sign that a snake might be poisonous. A few harmless snakes have vertical eye pupils and may be mistaken as venomous on this basis. Vertical eye pupils are often hard to see in dim light or shade.

The best identifying character is the facial pit. This is a depression on the side of the face just below a line between the eyes and the nostrils (See Figure 1). This pit can be seen from a safe distance if you know what to look for. The venomous snakes in Oklahoma have facial pits. Looking for a combination of these characters will usually help you identify a snake properly.

If you have a dead snake, it can be identified by examining the scales under the tail. The tail is that portion of the snake that extends past the vent (anus). Poisonous snakes have a single row of scales immediately beyond the vent, while non-poisonous snakes usually have 2 rows of scales beyond the vent (See Figure 1). Viewing snakes at local zoos and purchasing a good field guide will further sharpen your identification skills.

Regardless of precautions, people still get bitten by poisonous snakes. If bitten, the most important thing to remember is to remain calm. Snakebites are not usually fatal. Currently, 6,000 to 7,000 people are bitten each year, with an average death rate of 15 people per year. This is less than the num-

ber of people that die each year from bee stings or lightning, and it is less than the number of people that die each day in automobile accidents.

There are two general forms of snake venoms: neurotoxins and hemotoxins. Neurotoxins are fairly fast acting and can cause death by paralysis. Hemotoxins are slower acting toxins and can cause death by hemorrhaging. No venom is entirely neurotoxic or hemotoxic; cobras, mambas, and coral snakes produce mostly neurotoxins, while the pit vipers produce mostly hemotoxins. Both types of venoms can be very potent, but neurotoxins are generally considered to be more dangerous.

There is a little agreement (even among medical personnel) regarding the proper method of snakebite treatment. Treatments range from doing absolutely nothing to removing blood vessels and tissues from the afflicted area. A few things are agreed upon, however. First, the victim must remain calm. Caffeine, cigarettes, or alcohol should not be administered. It is important to get to a hospital as quickly as possible. In most cases doctors can administer an antitoxin that will help reduce damage caused by the bite. Antivenom kits can be purchased through local physicians, but the kits are expensive, may not keep indefinitely, should be administered by trained personnel, and can be dangerous if not deadly. Modern snakebite kits are available at sporting goods or outdoor equipment stores. These kits should be used by trained people. Seek advice and instructions from your physician before going into snake country. In summary, the best thing to do in the event of a

poisonous snakebite is to remain calm and get to a hospital as quickly as possible.

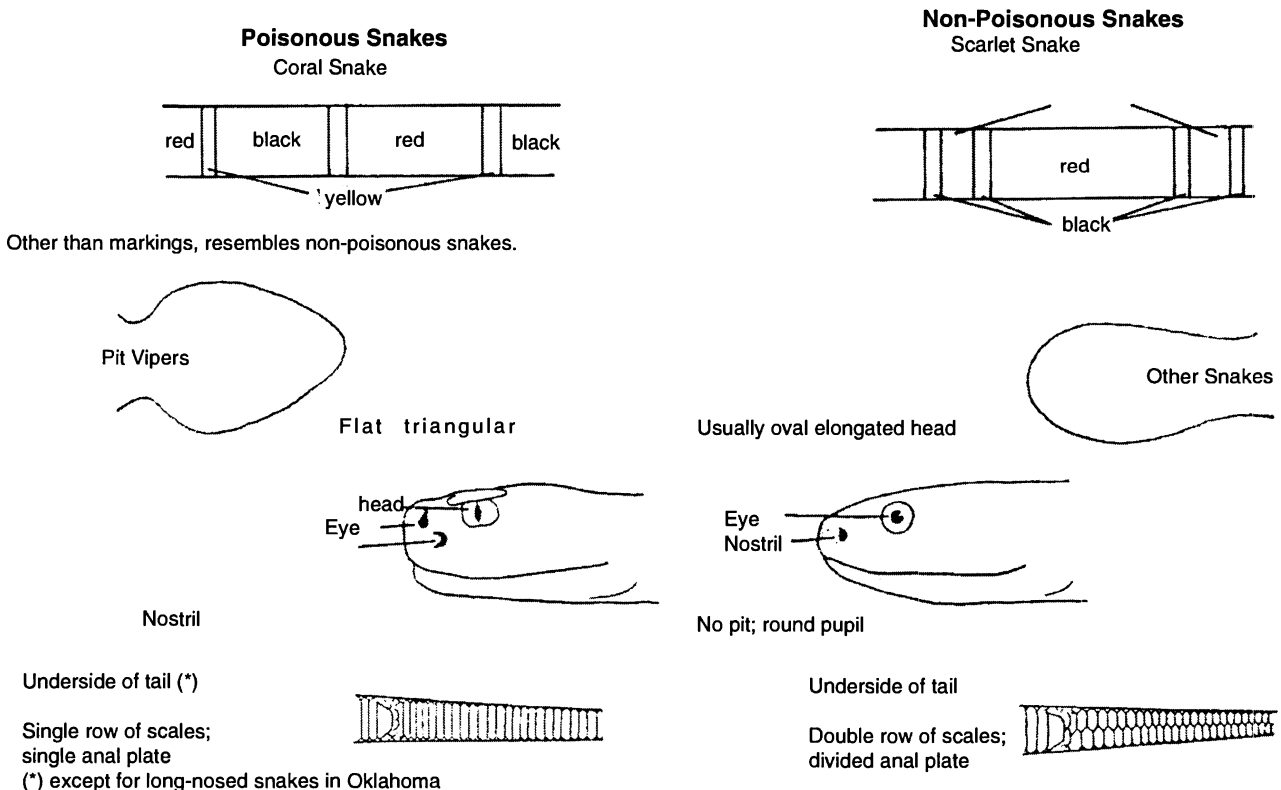
Before concluding this section, it may be worthwhile to mention the coral snake. The eastern coral snake is a medium-sized species that is related to the old-world cobras, mambas, etc. Coral snakes are found across the Red River in Texas and individuals may be carried into Oklahoma by floods, but no authentic record of a coral snake has ever been reported in Oklahoma. The problem with coral snakes is that they are different from pit vipers; coral snakes have rounded heads, circular eye pupils, and lack facial pits. Identification is based on the color pattern. Coral snakes have red, yellow, and black rings that encircle the body. Two harmless species, the milksnake and the scarlet snake, are also red, yellow and black, but their bodies do not have encircling bands. These snakes also differ in the pattern that the colors have. The best way to remember the color patterns is by thinking of the following rhymes:

If red touches yellow, will harm a fellow  
If red touches black, it's a friend of Jack.

Or

Red and yellow, kill a fellow  
Red and black, venom lack.

**Figure 1. Snake Identification**



## Snakes and Man

Man has more impact on the life of snakes than vice-versa. Every day man destroys precious habitat and pollutes streams. Pesticides reduce the amount of food available to some species. Increasing pesticide levels are accumulating in the tissues and organs of snakes, possibly affecting their growth and reproduction.

The impact of snakes upon man is both positive and negative. Snakes are capable of consuming large numbers of rodent pests, many of which are carriers of disease and parasites that adversely affect livestock and human populations. One study of bullsnakes found that a single 2.5-pound bullsnake could consume 6.7 pounds of food in a six-month period. This approximately equals the weight of twelve pocket gophers. In another food study of bullsnakes, one individual was found to have eaten 35 mice at one sitting. Considering the amount of damage that a single mouse can cause to crops, grain, and food, a bullsnake is a very valuable ally. Snakes are also making news on the medical front. Currently, much time and effort is being given to the research of venoms in association with a number of diseases.

Unfortunately for snakes, man tends to accentuate the negative. Damages to livestock caused by snakes are minimal compared to other sources of injury. While a single snake can inflict a lot of damage to chickens, capture, and removal of these individuals will often solve the problem. Persecution of all snakes may have Biblical origins, but is perpetuated by ignorance and the needlessly exaggerated fear of death from snakebite.

Snakes and religion are a very curious combination. While snakes are loathed by some religions, they are revered in others. Ancient Egyptians had a snake god and kept cobras as pets in their homes. In the United States, snakes are used by the Hopi Indians in many religious ceremonies. In West Virginia, church members regularly handle venomous snakes as a symbol of their faith in God. The average attitude falls somewhere between loathing and worshipping snakes. As more is learned about snakes, many people find their fear replaced by fascination.

As stated before, snakes can be intimately associated with man, and some species actually thrive around homes. For those individuals who fear or dislike snakes, there is an ongoing battle to kill snakes. This may temporarily reduce the number of snakes, but it can never eliminate them. As long as food and habitat are available, there will always be snakes. By altering habitat, a more permanent reduction in numbers of snakes can be achieved. Disposal of brush piles and scattered refuse will remove cover for small mammals and snakes. Placing feed and grain in rodent-proof containers will reduce rodent numbers and thereby reduce snake numbers. There are no known snake repellents, although

one company makes a "trap" using pine tar. Snakes can be kept out of houses by sealing cracks in foundations, around windows, air conditioners, and doors. Following these few simple suggestions will help reduce the number of unwanted snakes around your home.

**Note: We have attempted to use the common names suggested by Collins et. al., Standard Common and Current Scientific Names for North American Amphibians and Reptiles, SSAR Herp publication No. 12., 1982.**

**Many common names are used. A given snake may be called by a variety of names in different states or often in different parts of the same state. The common use of "moccasin" for any snake found near water has led to the needless death of many non-poisonous snakes.**

## Further Information

The following books can be obtained from most book stores or may be borrowed from your local library.

- Behler, John L. and L. Wayne King. The Audubon Society Field Guide to North American Amphibians and Reptiles Alfred A. Knopf, New York. 719 pgs. 1979. Includes color photographs of all the amphibians and reptiles of North America and brief description of distribution and habitats.
- Conan, Roger, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston. 429 pgs. 1975. Includes line drawings and color paintings of most amphibians and reptiles east of the 100th meridian with brief description of their distribution and habitats.
- Fitch, Henry. Reproductive Cycles in Lizards and Snakes. Museum of Natural History, Univ. of Kansas Misc. Public No. 52:1-247. 1970. Reviews and reports clutch size, clutch frequency, and reproductive behavior of lizards and snakes from throughout the world.
- Smith, Hobart M. and Edward D. Brodie, Jr. A Guide to Field Identification-Reptiles of North America. Golden Press, New York, NY 240 pgs. 1982. Color plates of all North American reptiles with easy to use identification keys.
- Webb, Robert G. Reptiles of Oklahoma. University of Oklahoma Press, Norman, OK 370 pgs. 1975. Excellent spot distribution maps and keys to the identification of all native Oklahoma reptiles but lacks drawings or photos of the species.

## Other Sources

Additional information can be obtained by contacting the reptile curator at Oklahoma City Zoo or Tulsa Zoo or by contacting the biology department at your local college or university.

## A Checklist of Oklahoma Snakes

### Harmless snakes

*Arizona elegans*—glossy snake  
*Carphophis amaenus*—worm snake  
*Cemophora coccinea*—scarlet snake  
*Coluber constrictor*—racer  
*Diadophis punctatus*—ring-neck snake  
*Elaphe guttata*—great plains rat snake  
*E. obsoleta*—black rat snake  
*Farancia abacura*—mud snake  
*Heterodon nasicus*—western hognose snake  
*H. platyrhinos*—eastern hognose snake  
*Hypsiglena torquata*—Texas night snake  
*Lampropeltis calligaster*—prairie kingsnake  
*L. getulus*—speckled and desert kingsnakes  
*L. triangulum*—milk snake  
*Leptotyphlops dulcis*—blind snake  
*Masticophis flagellum*—coachwhip snake  
*Nerodia erythrogaster*—yellow-bellied and blotched water snake  
*N. fasciata*—broad-banded water snake  
*N. rhombifera*—diamond-back water snake  
*N. sipedon*—northern and midland water snake  
*Opheodrys aestivus*—keeled green snake  
*Pituophis melanoleucus*—bullsnake  
*Regina grahami*—Graham's water snake  
*P. rigida*—glossy water snake  
*Rhinocheilus lecontei*—long-nosed snake  
*Sonora semiannulata*—great plains ground snake

*Storeria dekayi*—brown snake  
*S. occipitomaculata*—red bellied snake  
*Tantilla gracilis*—flat-headed snake  
*T. nigriceps*—black-headed snake  
*Thamnophis cyrtopsis*—black-necked garter snake  
*T. elegans*—wandering garter snake  
*T. marcianus*—checkered garter snake  
*T. proximus*—western ribbon snake  
*T. radix*—plains garter snake  
*T. sirtalis*—red-sided and Texas garter snakes  
*Tropidozonion lineatum*—lined snake  
*Virginia striatula*—rough earth snake  
*V. valeriae*—smooth earth snake

### Poisonous snakes

*Agkistrodon contortrix*—copperhead  
*A. piscivorus*—cottonmouth or water moccasin  
*Crotalus atrox*—western diamond-back rattlesnake  
*C. horridus*—timber rattlesnake  
*C. viridis*—prairie rattlesnake  
*Sistrurus catenatus*—western massasauga rattlesnake  
*S. miliarius*—western pigmy rattlesnake

### Acknowledgements:

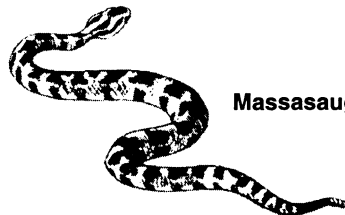
This material was reviewed by Dr. Jeff Black, Biology Department, Oklahoma Baptist State University; Alice Echelle, Research Associate, OSU Zoology Department, Bob Jenni, Naturalist and Lecturer, Edmond, and biologists from the Game Division, Oklahoma Department of Wildlife. Authors of the original Fact Sheet were Bill Altman and George Cline.



Timber rattlesnake



Copperhead



Massasauga

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