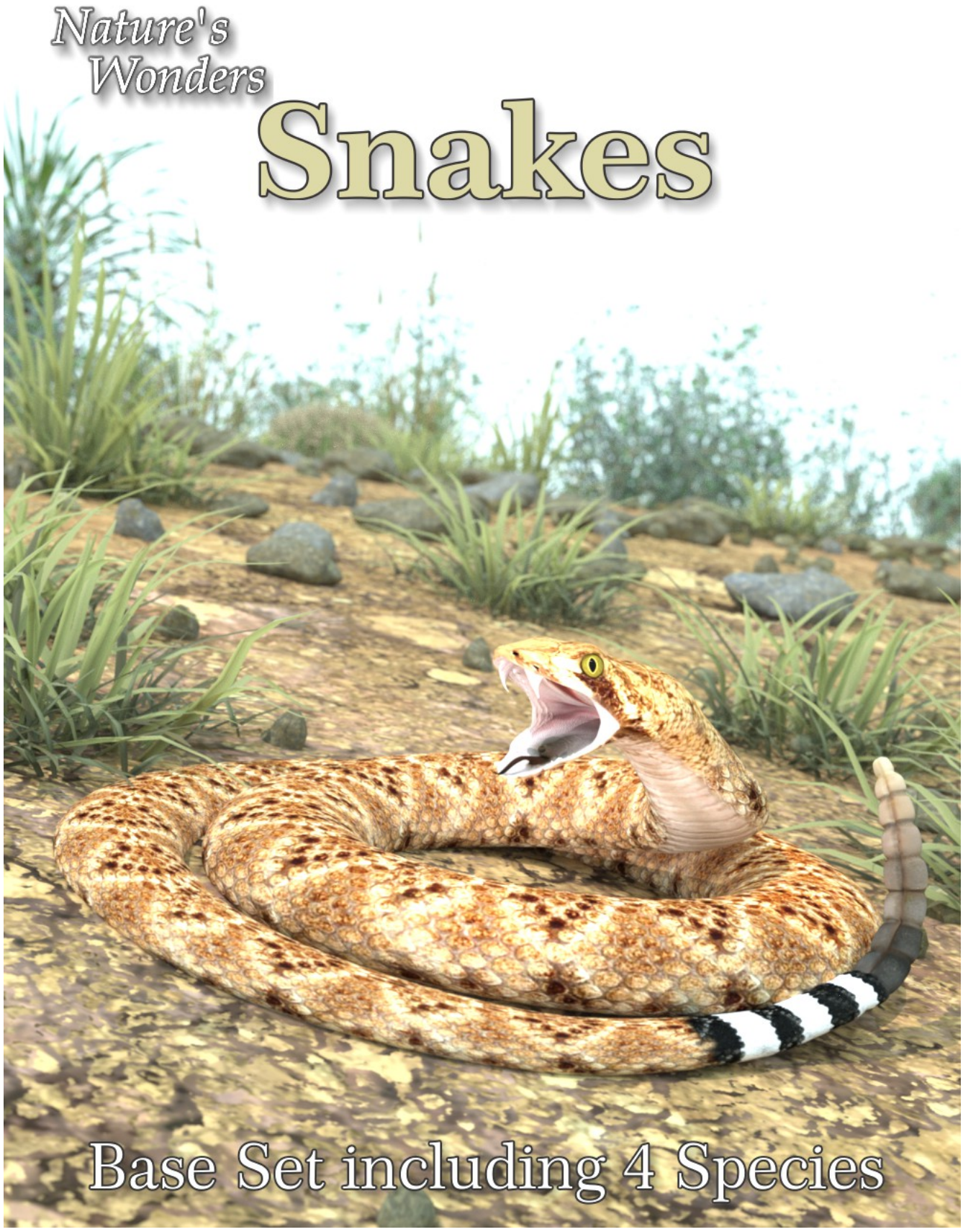


A 3D Model set by Ken Gilliland

Nature's Wonders

Snakes

Manual

Field Guide

Nature's Wonders

Snakes

Introduction

Snakes are found on every continent except Antarctica. They are elongated, limbless reptiles of the suborder *Serpentes.* Many species of snakes have skulls with several more joints than their lizard ancestors and relatives, enabling them to swallow prey much larger than their heads. To accommodate their narrow bodies, snakes' paired organs, such as kidneys, appear one in front of the other instead of side by side, and most only have one functional lung. Around thirty families of snake are currently recognized, comprising about 520 genera and about more than 4,170 species.

Nature's Wonder Snakes contain 4 popularly known snakes, ranging from the Egyptian Cobra (or "Asp") which Cleopatra met her end with, to the most commonly known of "Rattlers," the Western Diamondback.

The generic model, as with all Nature's Wonder base models, is capable of creating many diverse species from a single 3D mesh. From Cobras and Rattlers to Boas and Pythons, the model and its morphs provide support for hundreds of different species to be created. The model is divided in 5 sections; Head, Fore, Mid, Hind and Tail with the 3 middle sections having 18-20 body parts per section. The sections has its own separate set of EZ Pose controls, so it is possible to bend just a portion of the snake rather than the entire snake.

The set has both native DAZ Studio and Poser versions and supports Iray, 3Delight, Firefly and Superfly render engines.

Overview and Use

The set is located within the **Animals : Nature's Wonder** folder. Here is where you will find a number of folders, such as **Manuals, Resources** and **Fauna Libraries**. Let's look at what is contained in these folders:

- **Fauna Libraries:** This folder holds the actual species and poses for the "premade" fauna. The fauna for this set can be found in the following folder(s):
  - **Reptiles/Snakes of the World**
- **Manuals:** Contains a link to the online manual for the set.
- **Props:** Contains any props that might be included in the set
- **Resources:** Items in this folder are for creating and customizing your fauna included in the set
  - **… Based Models:** This folder has the blank, untextured model(s) used in this set. These models are primarily for users who wish to experiment with poses or customize their own species. When using physical renderers such as Iray and Superfly, SubD should be turned up. For DAZ

Studios 3Delight renders, the SubD must be turned from the "High Resolution" setting to the "Base" setting (otherwise some areas will render incorrectly transparent).

Creating a Specific Snake using Poser

1. For this example, we'll create the Egyptian Cobra.
2. Load Poser, select the FIGURES library and go to the "Animals", "Nature's Wonders" and then the Nature's Wonders Fauna Libraries Reptiles folder.
3. Go to the Snakes of the World folder and select the Firefly or Superfly sub-folder.
4. Select the Egyptian Cobra (or a snake of your choice) and load it by clicking the mouse.

Creating a Specific Snake using DAZ Studio

1. For this example, we'll create the Egyptian Cobra.
2. Load DAZ Studio and go to the "Animals", "Nature's Wonders" and then the Nature's Wonders Fauna Libraries Reptiles folder.
3. Go to the Snakes of the World folder and select the 3Delight or Iray sub-folder.
4. Select the Egyptian Cobra (or a snake of your choice) and load it by clicking the mouse.

Posing your Snake

The poses were designed around the default snake model (found in "Resources"). Posing species that use more extreme morphs and different lengths, may not fit the poses perfectly. Some minor adjustments will probably be necessary.

There are a lot of joints in this model and moving them can become overwhelming. I decided to create master controls that break the snake into 5 different sections to help ease this burden; Head (3 parts), Fore (18 parts), Mid (20 parts), Hind (20 parts) and Tail (8 parts).

Because the model is a very long cylinder shape, zooming in on the snake and then rotating it can be cumbersome. The model in the BODY and Mid01 sections are centered at 0,0,0. It is usually best practice to leave the Mid01 section at 0,0,0 and use the main (BODY) section for your x,y,z rotation and movement. Moving and/or rotating the Mid01 will exacerbate camera rotation issues with the model. In Poser, if you want to work on the head of the snake, using the Face Cam (once zoomed and focused on the head) will help significantly.

Cobra Hood

Cobras expand their hoods when provoked or hunting. Most users will want this feature so it has been set "On" by default in Cobra species. To turn it "Off", expand or lessen it, use the "Cobra Hood" morph (found in *Creation Controls/Species Controls*).

When the hood is expanded, extreme bends may distort the model. This happens particularly when using the Side and Twist rotations. It is best practice to create smaller bends in the hood sections when the hood is expanded.

About Snakes

Edited from Wikipedia

Snakes are elongated limbless reptiles of the suborder Serpentes. They are ectothermic, amniote vertebrates covered in overlapping scales much like other members of the group.

Snake have no eyelids. Instead, they have a protective scale called a *brille* that covers their eyes. It protects their eyes from outside dirt, debris, and other harmful elements. "Brille" comes from the Germanic and means "glasses."

Normally, you can't see the brille on snakes. It's a clear eye cap, also referred to as a spectacle, that doesn't move or even blink, as normal eyelids would. You can see brille when it's almost time for a snake to molt or shed its scales. Much like the rest of the snake's scales, the brille becomes cloudy, dull, and easy to distinguish from the eye underneath. If all goes well, the brille detaches the same way as the rest of the snake's skin, leaving the eyes with a new, clear brille covering.

Many species of snakes have skulls with several more joints than their lizard ancestors and relatives, enabling them to swallow prey much larger than their heads. To accommodate their narrow bodies, snakes' paired organs (such as kidneys) appear one in front of the other instead of side by side, and most only have one functional lung. Lizards have independently evolved elongate bodies without limbs or with greatly reduced limbs, leading to many lineages of legless lizards. These resemble snakes, but several common groups of legless lizards have eyelids and external ears, which snakes lack, although this rule is not universal (see *Amphisbaenia, Dibamidae*, and *Pygopodidae*).

Snakes are thought to have evolved from either burrowing or aquatic lizards, perhaps during the Jurassic period, with the earliest known fossils dating to between 143-167 Ma ago. The diversity of modern snakes appeared during the Paleocene epoch (c. 66 to 56 Ma ago, after the Cretaceous–Paleogene extinction event). The oldest preserved descriptions of snakes can be found in ancient Egyptian writings from 450 BC.

All snakes are strictly carnivorous, preying on small animals including lizards, frogs, other snakes, small mammals, birds, eggs, fish, snails, worms, and insects. Most species of snake are nonvenomous and those that have venom use it primarily to kill and subdue prey rather than for self-defense, but some possess venom that is potent enough to cause painful injury or death to humans. While all snakes do have some small teeth, these snakes are used for grasping its prey. Snakes cannot bite or tear their food to pieces so must swallow their prey whole. Nonvenomous snakes either swallow prey alive or kill by constriction.

After eating, snakes become dormant to allow the process of digestion to take place. This is an intense activity, especially after consumption of large prey. In species that

feed only sporadically, the entire intestine enters a reduced state between meals to conserve energy. The digestive system is then 'up-regulated' to full capacity within 48 hours of prey consumption. Being ectothermic ("cold-blooded"), the surrounding temperature plays an important role in the digestion process. The ideal temperature for snakes to digest food is 30 °C (86 °F). There is a huge amount of metabolic energy involved in a snake's digestion. If a snake is disturbed after having eaten recently, it will often regurgitate its prey to be able to escape the perceived threat. When undisturbed, the digestive process is highly efficient; the snake's digestive enzymes dissolve and absorb everything but the prey's hair (or feathers) and claws, which are excreted along with waste.

Snakes eating their own tails is a rare behavior, and the reasons behind it are not fully understood. It's believed to be a combination of factors, including stress, confusion, and perhaps even mistaken identity with prey. In some cases, snakes may become disoriented due to heat stress or be confused by their surroundings, mistaking their own tail for food.

The lack of limbs does not impede the movement of snakes. They have developed several different modes of locomotion to deal with particular environments. Unlike the gaits of limbed animals, which form a continuum, each mode of snake locomotion is discrete and distinct from the others; transitions between modes are abrupt.

Lateral undulation is the sole mode of aquatic locomotion, and the most common mode of terrestrial locomotion. In this mode, the body of the snake alternately flexes to the left and right, resulting in a series of rearward-moving "waves". While this movement appears rapid, snakes have rarely been documented moving faster than two body-lengths per second, often much less.

Terrestrial lateral undulation is the most common mode of terrestrial locomotion for most snake species. In this mode, the posteriorly moving waves push against contact points in the environment, such as rocks, twigs, irregularities in the soil, etc. Each of these environmental objects, in turn, generates a reaction force directed forward and towards the mid-line of the snake, resulting in forward thrust while the lateral components cancel out.

Sidewinding is most often employed by colubroid snakes (colubrids, elapids, and vipers) when the snake must move in an environment that lacks irregularities to push against (rendering lateral undulation impossible), such as a slick mud flat, or a sand dune, sidewinding is a modified form of lateral undulation in which all of the body segments oriented in one direction remain in contact with the ground, while the other segments are lifted up, resulting in a peculiar "rolling" motion. The sidewinder moves forward by throwing a loop of itself and then pulling itself up by it. By lowering its head the snake gets leverage, straightening itself out and pressing itself against the ground, it brings itself forward and at an angle that leaves it ready for the next jump. The head and the loop are in effect the two feet upon which the snake walks. The snake's body, appearing roughly perpendicular to its direction, may bewilder the observer, since preconception may lead one to associate snake movement with a head that leads and a body that follows. It appears the sidewinder is going sideways - but precisely where the snake is going, where it wants to go, the head gives clear indication. The snake leaves behind a trail that looks like a series of hooks one after the next. Snakes can move backwards to retreat from an enemy, though they normally do not.

When push-points are absent, but there is not enough space to use sidewinding because of lateral constraints, such as in tunnels, snakes rely on concertina locomotion. In this mode, the snake braces the posterior portion of its body against the tunnel wall while the front of the snake extends and straightens. The front portion then flexes and forms an anchor point, and the posterior is straightened and pulled forwards. This mode of locomotion is slow and very demanding, up to seven times the cost of laterally undulating over the same distance.

The movement of snakes in arboreal habitats has only recently been studied. While on tree branches, snakes use several modes of locomotion depending on species and bark texture. In general, snakes will use a modified form of concertina locomotion on smooth branches, but will laterally undulate if contact points are available.

The slowest mode of snake locomotion is rectilinear locomotion, which is also the only one where the snake does not need to bend its body laterally, though it may do so when turning. In this mode, the belly scales are lifted and pulled forward before being placed down and the body pulled over them. Waves of movement and stasis pass posteriorly, resulting in a series of ripples in the skin. The ribs of the snake do not move in this mode of locomotion and this method is most often used by large pythons, boas, and vipers when stalking prey across open ground as the snake's movements are subtle and harder to detect by their prey in this manner.

Snakes are steeped in symbolism throughout the world. In ancient Mesopotamia, representations of two intertwined serpents are common in Sumerian art and Neo-Sumerian artwork and still appear sporadically on cylinder seals and amulets until as late as the thirteenth century BC. The horned viper appears in Kassite and Neo-Assyrian kudurrus and is invoked in Assyrian texts as a magical protective entity. A dragon-like creature with horns, the body and neck of a snake, the forelegs of a lion, and the hind-legs of a bird appears in Mesopotamian art from the Akkadian Period until the Hellenistic Period (323 BC–31 BC).

In Egyptian history, the snake occupies a primary role with the Nile cobra adorning the crown of the pharaoh in ancient times. It was worshiped as one of the gods and was also used for sinister purposes: murder of an adversary and ritual suicide (Cleopatra). The ouroboros was a well-known ancient Egyptian symbol of a serpent swallowing its own tail.

In the Bible, King Nahash of Ammon, whose name means "Snake", is depicted very negatively, as a particularly cruel and despicable enemy of the ancient Hebrews.

The ancient Greeks used the Gorgoneion, a depiction of a hideous face with serpents for hair, as an apotropaic symbol to ward off evil.

Three medical symbols involving snakes that are still used today are Bowl of Hygieia, symbolizing pharmacy, and the Caduceus and Rod of Asclepius, which are symbols denoting medicine in general.

Egyptian Cobra

Naja haje

It is one of the most venomous species of snakes in North Africa, and has bitten many humans, including Cleopatra. It is also referred to as an "Asp". It is represented in Egyptian mythology by the cobra-headed goddess Meretseger. A stylized Egyptian cobra—in the form of the uraeus representing the goddess Wadjet—was the symbol of sovereignty for the Pharaohs who incorporated it into their diadem.

Habitat: It ranges across most of North Africa north of the Sahara, across the savannas of West Africa to the south of the Sahara, south to the Congo Basin and east to Kenya and Tanzania.

It occurs in a wide variety of habitats like steppes, dry to moist savannas, arid semi-desert regions with some water and vegetation. This species is frequently found near water. It is a terrestrial and crepuscular or nocturnal species. It can, however, be seen basking in the sun at times in the early morning.

Status: Least Concern.

Diet: This species prefers to eat toads, but it will prey on small mammals, birds, eggs, lizards and other snakes.

Identification: The most recognizable characteristics of this species are its head and hood. The length of the Egyptian cobra is largely dependent on subspecies, geographical locale, and population. It averages roughly 1.4 m (4.6 ft) in length. The longest specimen recorded so far measured 2.59 m (8.5 ft).

The head is large and depressed and slightly distinct from the neck. The neck of this species has long cervical ribs capable of expanding to form a hood, like all other cobras. The snout of the Egyptian cobra is moderately broad and rounded. The eye is quite big with a round pupil. The body of the Egyptian cobra is cylindrical and stout, with a long tail.

The colour is highly variable, but most specimens are some shade of brown, and often a "tear-drop" mark below the eye. Some are more copper-red or gray-brown in color. Specimens from northwestern Africa (Morocco) are almost entirely black. The ventral side is mostly a creamy white, yellow brown, grayish, blue-gray, dark brown or black in coloration, often with dark spots

Venom: The venom consists mainly of neurotoxins and cytotoxins. The average venom yield is 175 to 300 mg in a single bite. The venom affects the nervous system, stopping the nerve signals from being transmitted to the muscles and at later stages stopping those transmitted to the heart and lungs as well, causing death due to complete respiratory failure. The bite itself causes local pain, severe swelling, bruising, blistering, necrosis and variable non-specific effects which may include headache, nausea, vomiting, abdominal pain, diarrhea, dizziness, collapse or convulsions along with possible moderate to severe flaccid paralysis. This cobra's venom is slow-acting and doesn't always cause death in humans.

Unlike some other African cobras, this species does not spit venom.

Subspecies: Naja haje was first described by Swedish zoologist Carl Linnaeus in 1758. The snouted cobra (*Naja annulifera*) and Anchieta's cobra (*Naja anchietae)* were formerly regarded as subspecies of *Naja haje*, but have since been shown to be distinct species. The Arabian populations were long recognized as a separate subspecies, *Naja haje arabica*, and the black populations from Morocco sometimes as *Naja haje legionis*. A recent study found that the Arabian cobra constitutes a separate species, *Naja arabica*, whereas the subspecies *legionis* was synonymised with *N. haje*. The same study also identified the West African savanna populations as a separate species and described it as *Naja senegalensis*.

California Whipsnake

Masticophis lateralis

This snake is also known as the “Striped Racer” or “Two Lined Racer”.

Habitat: It is found in habitats of the coast, desert, and foothills of California in the United States. It prefers woodlands, grasslands, chaparral scrublands, and riparian habitats.

Status: Near Threatened. It is threatened by habitat destruction.

Diet: It is known to eat a variety of live animals including insects, lizards, snakes, birds, and small mammals. It shows a strong preference for lizards, which are captured by a grasp of the mouth, and swallowed alive.

It is fast-moving, diurnal, and an active forager. It commonly moves over and through brush and trees to avoid predation and to capture prey.

Identification: It is 90–120 cm (36–47 inches) in total length. It is slender, with a yellowish stripe along each side, set against a dark brown or black back.

Venom: It is not venomous, but likely to strike if captured.

Subspecies: This snake has two subspecies.

- *M. l. lateralis.* First reported by Hallowell in 1853. The “chaparral” whipsnake is the nominate subspecies. It is common in California and northern Baja California, Mexico. The subspecies is often associated with broken (variable) habitat types that range from northwestern to extreme southern California and further south into Northwestern Mexico.
- *M. l. euryxanthus.* First reported by Riemer in 1954. The “Alameda” whipsnake is endemic to California. The subspecies is considered threatened there. Its range is relatively small, and much of the subspecies' habitat is threatened by

development. It was first collected by Archie Mossman and later described by Riemer in 1954. The Alameda Whipsnake is a threatened species of colubrid snake distinguishable by its broad head, large eyes, black and orange coloring with a yellow stripe down each side, and a slender neck. The Alameda Whipsnake is a wary creature known for its speed and climbing abilities utilized when escaping predators or hunting prey.

California Whipsnake at Quail Hollow (Ken Gilliland's residence)

Eastern Pine Snake

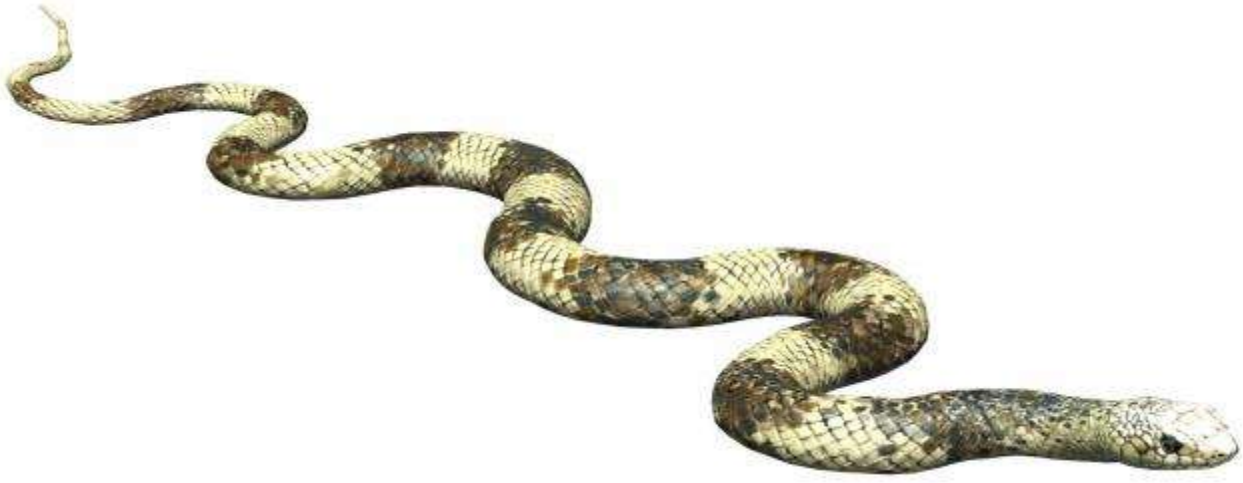
Pituophis melanoleucus

The species has a variety of common names, including: pine snake, pinesnake, common pine snake, bullsnake, black and white snake, carpet snake, chicken snake, common bullsnake, eastern bullsnake, eastern pine snake, horn(ed) snake, New Jersey pine snake, North American pine snake, northern pine snake, pilot snake, and white gopher snake.

Habitat: The species is endemic to the eastern United States including the States of Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Jersey, North Carolina, South Carolina, Tennessee, Delaware and Virginia.

It inhabits pine flatwoods, sandy pine-oak woodlands, prairies, cultivated field, open brushland, rocky desert and chaparral.

Status: Least Concern to Threatened. It has a wide distribution and large number of sub-populations, although the total populations appears to be declining at a slow rate. The species is thought to be impacted by continued habitat degradation and destruction. It is present in a variety of protected areas. Habitat loss is the major threat to populations of this species.



Subspecies *mugitus*, the Florida pine snake, is listed as 'vulnerable'. The population is assumed to be declining as a result of habitat loss. This loss includes the removal of tree stumps, which causes a decrease in the amount of underground habitat structures. In addition, predation at all stages of life from nine-banded armadillos, feral hogs, and red imported fire ants could be increasing. Finally, mortality caused by humans, domesticated pets, and roads all contribute to further harm to the subspecies.

The subspecies *lodingi* is 'threatened' primarily due to habitat loss, though it is also affected by snake fungal disease and intentional killing by humans.

Diet: It preys on rats, mice, moles and other small mammals and eggs. It often enters rodent burrows in search of a meal. In these cases, multiple kills are frequent, with the snake pressing the mice against the walls of the burrow.

The snake remains underground in cold weather or during the heat of summer days.

Identification: It is a large snake, growing to 120–230 cm (47–91 inches) in total length (including tail). It is powerfully built. The head is small and somewhat pointed with an enlarged rostral scale that extends upward between the internasal scales. Usually, four prefrontal scales are seen. At mid-body are 27-37 rows of keeled dorsal scales. The anal plate is single. The color pattern consists of a light ground color overlaid with black, brown, or reddish-brown blotches

Venom: It is nonvenomous.

Subspecies: Three subspecies are recognized as being valid.

- *P. m. melanoleucus.* First reported by Daudin in 1803. The nominate subspecies is known as the northern pine snake.
- *P. m. lodingi.* First reported by Blanchard in 1924. It is known as the black pine snake. The species is endemic to southern Mississippi and southwestern Alabama. It can be differentiated from other pinesnakes by its dark brown to black upper (dorsal) and lower (ventral) surfaces.
- *P. m. mugitus.* First reported by Barbourin in 1921. It is known as the Florida pine snake. It is endemic to the Coastal Plain of the southeastern United States. Their pattern consists of dark brown or rust colored splotches on a tan or light cream background color. Toward the head, these markings are more faded and darker; toward the tail, they are more vivid.

Western Diamondback

Crotalus atrox

This rattlesnake is infamous for causing the majority of snakebite fatalities in northern Mexico and the United States.

Habitat: It lives in elevations from below sea level up to 6,500 feet (2,000 m). This species ranges throughout the Southwestern United States and northern half of Mexico.

Its habitats range from flat coastal plains to steep rocky canyons and hillsides; it is associated with many different vegetation types, including desert, sandy creosote areas, mesquite grassland, desert scrub, and pine-oak forests.

Status: Least Concern. Currently, western diamondback rattlesnakes are not threatened or endangered. They are listed as such due to their wide distribution or presumed large population, or because they are unlikely to be declining fast enough to qualify for listing in a more threatened category. The population trend was stable when assessed in 2007.

They are also heavily collected from the wild, frequently being drawn out of their hiding places with gasoline and used in rattlesnake roundups, where they are killed for food, skins and entertainment.

This Western diamondback rattlesnake may be the most common rattlesnake species found in homes and in direct conflict with human development in the American Southwest, particularly in the rapidly expanding metro areas of Phoenix and Tucson. Relocation of animals is seen as a sometimes controversial management solution.

Diet: 95% of their prey is small mammals. This includes prairie dogs, kangaroo rats, pocket gophers, voles, wood rats, pocket mice, white-footed mice, harvest mice, fox squirrels, cotton rats, ground squirrels, rabbits, jackrabbits, and moles.

Identification: Adults commonly grow to 120 cm (47 inches) in length. Specimens over 150 cm (59 inches) are infrequently encountered, while those over 180 cm (72 inches) are very rare, and the largest reported length considered to be reliable is 213 cm (84 inches). Males become much larger than females.

The color pattern generally consists of a khaki ground color, but it may also be pinkish or fallow, brick red, yellowish blonde, or white. This ground color is overlaid dorsally with a series of 23-45 dorsal body blotches that are brown or a darker umber. The tail has two to eight (usually four to six) black bands separated by white or gray interspaces. Its postocular stripe is gray or umber and extends diagonally from the lower edge of the eye across the side of the head. This stripe is usually bordered below by a white stripe running from the upper preocular scale down to the supralabial scales just below and behind the eye.

Vemon: Like most other American pit vipers, the venom contains proteolytic enzymes. Proteolytic venoms are concentrated secretions that destroy structural tissues and proteins via catabolism, which help in disabling prey.

This species has LD50 values of 2.72 mg/kg intravenous, 20 mg/kg intramuscular and 18.5 mg/kg subcutaneous, which is far less toxic than many other rattlesnakes. However, because of its large venom glands and specialized fangs, the western diamondback rattlesnake can deliver a large amount of venom in a single bite. The average venom yield per bite is usually between 250 and 350 mg, with a maximum of 700–800 mg. Severe envenomation is rare but possible, and can be lethal. Mortality rate of untreated bites is between 10 and 20%

Special Thanks to:

… to my beta testers, Alisa and FlintHawk

Species Accuracy and Reference Materials

The author-artist has tried to make these species as accurate to their real life counterparts as possible. Snakes of the same species vary considerably, just as all others do in nature. The snakes were created using the correct field markings and the most common similarities.

With the use of one generic model to create dozens of unique moth species, some give and take is bound to occur. In addition, 3D-models have many technical challenges, which make exact representations difficult, if not impossible. It's best to think of these moths represented as resembling the particular species, and they may not, in some cases, be 100% scientifically accurate.

The model and morphs were created using Luxology's Modo. The texture maps were created in Corel's Painter. The model was rigged in Poser and materials created in Poser and DAZ's DAZ Studio.

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