

# Snake, Rattle, and Roll

**Average Program Length:** 45 minutes

**Meeting Location:** Visitor Center Patio

**Total material list:**

- Four laminated rattlesnake photos (one per species type)
- Maraca
- 3 rubber snakes of different sizes
- Clear PVC pipe
- Snake Hook or a Stick
- Fresh/frozen pineapple
- Red gelatin
- Droppers
- Venom protein chart (Park Provides)
- Computers--scouts need to have access to this at home or in a local library
- Poster with labeled rattlesnake traits (Park Provides)
- Diagram with infrared objects (Park Provides)
- Long Forceps
- Long Syringe
- Box

## Activities by Scout Level

### Girl Scouts

**Daisies and Brownies-** pick at least 3 of the steps below

**Juniors and Cadettes-** pick at least 4 of the steps below

**Seniors and Ambassadors-**pick at least 5 of the steps below

### Boy Scouts

**Lions, Tigers, Wolves, and Bears-** pick at least 3 of the steps below

**Webelos, Scout Rank, and Tenderfoot-** pick at least 4 of the steps below

**Second Class, First Class, Star Scouts, Life Scouts, and Eagle Scouts-**  
pick at least 5 of the steps below

# Background

Rattlesnakes have certain traits to help identify them, including keratin buttons, triangular heads, vertical pupils, live birth, heat sensing pits, and venom. These characteristics are adaptations (traits to help the animal survive).

**Keratin Buttons**--These are made up of the same material as our fingernails! Babies are born without any buttons, and therefore do not have a rattle. When they shed their skin for the first time, 3 weeks after they're born, they get their first button. Every time they shed, they get a new button. When they are threatened, they will rattle their tail as a warning, and the buttons will hit against each other, making the rattle noise. The rattlesnake doesn't want to bite you, because it would rather save it's venom for its dinner, and you're way to big to swallow. The warning tells you not to come any closer. They can shake their rattle 60 times per second!

Baby rattlesnakes are born live, not from eggs. When a reptile gives live birth, it is called **Ovoviviparous** (Oviparous is when a snake lays eggs, and Viviparous is the same as ovoviviparous, but with placental connection that provides gas exchange, like in mammals). Being ovoviviparous helps the rattlesnake species survive because the mom automatically protects the young which are inside her, and not outside in an egg. It's easy for the young to stay warm, and they don't have to struggle to get out of the egg. However, the mother has to struggle with the extra size and weight of keeping the young and not laying an egg.

Most rattlesnakes **brumate** (hibernation for snakes) from fall to spring. Snakes are ectothermic (cold-blooded), and need heat from their environment to stay warm, so they go into underground dens to stay warm. Because their ectothermic, they want to conserve as much energy as possible, and remain idle about 90% of their lives. Can you imagine only moving for about 2 hours every day, and sitting totally still the rest of the time?

How many times a day do you **eat**? Snakes only eat about once a week, and they can go much longer without food. Snakes mate in late-August or early September, then go into their winter dens. Ovulation doesn't occur until the next spring when they leave the dens. They develop internally inside the mother over the summer, and are born in September or October. After giving birth, the female will go into hibernation immediately without mating or feeding. They also do not feed when they are gravid (pregnant for snakes), so a female usually goes 19 months or more without eating.

Rattlesnakes often hunt at dawn or dusk (this is called crepuscular). The **vertical slits** on their eyes can expand more than a round pupil, and lets in more light. This makes it easier to see in low-light conditions. Vertical pupils also have a greater depth of field, making it easier to hit the prey target in an ambush hunting strategy.

The **heat sensing pits** are located right above the rattlesnake's lip. All snakes in the pit viper family have them, and it allows the snake to "see" infrared light (which comes from heat). Infrared light is invisible to us, but the rattle is able to see it using these pits. Living things are often warmer than nonliving things because bodies produce heat. The heat pits allow the rattlesnake to ambush its prey in low-light. They also allow the snake to follow the heat signature left by its prey after it is bitten, and before the venom takes over.

Rattlesnake **venom** is made up of many different components, but is mostly hemotoxic (attacks the blood) and sometimes neurotoxic (attacks the nervous system), depending on the species and location. The bite often causes internal bleeding and swelling at the bite site, but can also cause trouble breathing, loss of muscle control, and collapse into coma.

In San Diego, we have 4 different kinds of rattlesnakes--the Southern Pacific, the Red Diamond, the Southwestern Speckled, and the Colorado Desert Sidewinder (see photos). Notice the color adaptations of each. **The Southern Pacific rattlesnake**, which is the only species we have here at Cabrillo National Monument, has a diverse habitat range, from "grasslands, mountain forests [western slopes], coastal dunes, rocky deserts and hillsides, [to] agricultural fields". Therefore, they vary in color to blend into their environment, but are usually brown to olive brown to blend into the dirt, dries-leaves, and stone. The dark patches help them to camouflage under shady brush. The **Red Diamond rattlesnake** uses its reddish-brown color to blend into red desert-type clay (that are high in iron oxides). The **Southwestern Speckled Rattlesnake** uses its small spots to match the granite rocks in the mountains. The **Colorado Desert Sidewinder** is often a pale-cream or tan color, and often matches the speckled, rocky ground on which it lives.

Rattlesnakes are relatively docile, and will never attack you unprovoked. They are vital to our ecosystems. Rattlesnakes eat mice, rats, shrews, and other rodents that can carry disease and destroy crops and invade homes. Rodents can transmit disease to people and other animals through droppings, fleas, lice, mites and ticks. Some of the common diseases carried by mice are salmonella (bacteria in droppings), hantavirus (breathing in contaminated dust), leptospirosis (bacteria through urine), rat-bite fever (bites, scratches, consuming infected water or food) and the plague (from fleas or ticks that have bitten rodents; like the 14th century Black Plague that killed  $\frac{1}{3}$  of Europe's population). Rattlesnakes consume about 40% of their body weight each year. Averaging about 5 pounds in San Diego, a rattlesnake would eat 2 pounds of mice, or about 47 mice per year. They help keep rodent population numbers down to ensure a healthy, balanced ecosystem, as well as reducing damage to people. Moreover, each snake's consumption of mice eliminates thousands of ticks every year. They are needed to keep our ecosystems healthy.

If you are ever bitten by a rattlesnake, you will probably feel pain burning at the area of the bite. There will be one or two puncture marks, swelling at the area of the bite, and bruising and discoloration at the site of the bite. You may feel numbness, nausea, weakness lightheadedness, and difficulty breathing .According to the American Red Cross, these steps should be taken:

--**Wash** the bite with clean water and soap.

--**Immobilize** the bitten area and keep it lower than the heart.

--If the bite is on the hand or arm **remove any rings**, watches or tight clothing.

--Get **medical help immediately**.

Most bites don't occur in **isolated situations** where the victim may be a long distance from medical help. However if they do, some medical professionals, along with the American Red Cross, cautiously recommend this measure:

--If a victim is unable to reach medical care within 30 minutes, a **bandage**, wrapped two to four inches above the bite, may help slow venom. The bandage should not cut off blood flow from a vein or artery. A good rule of thumb is to make the band loose enough that a finger can slip under it.

Snakebite first aid methods are not always agreed upon by U.S. medical professionals, but they are nearly unanimous in their views of **what NOT to do**:

--NO ice or any other type of cooling on the bite. Research has shown this to be potentially harmful.

--NO tourniquets. This cuts blood flow completely and may result in loss of the affected limb.

--NO electric shock. This method is under study and has yet to be proven effective. It could harm the victim.

--NO incisions in the wound. Such measures have not been proven useful and may cause further injury.

# Matching Badges



Brownie-Home  
Scientist



Senior-Voice for  
Animals

BSA Reptile and  
Amphibian Study

Correlates to Next Generation  
Science Standards for LS1:  
FROM MOLECULES TO  
ORGANISMS: STRUCTURES  
AND PROCESSES

## Program Activities

1. Play the rattlesnake game! When you hear a rattlesnake in the wild, you need to stop and back up slowly to not startle the animal into defense. They can strike up to  $\frac{2}{3}$  of their body length, so never get close to one in the wild. They are not aggressive, but a scared animal will bite. Play a game similar to red light/green light, where scouts need to stop when they hear the rattle of a rattlesnake. One Scout will make the rattlesnake noise using a maraca. If the person playing the rattlesnake noise turns around and others are still moving, they're out!
2. Meet a live, native species snake ambassador at a local organization. EcoVivarium, a nonprofit in San Diego's North County, offers hands-on snake experiences.
3. Research snake relocation. Why is it important to safely relocate the animals back into the wild, and why we shouldn't we kill them? Some people say "The only good snake is a dead snake!", but they don't know how important these animals can be in maintaining a healthy population. Moreover, most bites occur when people try to kill the snake!

4. Using a rubber snake and a clear PVC pipe, practice how to complete a medical inspection on a venomous snake. Place your rubber snake on the floor. Grasp one side of the tube with forceps. Then, gently guide the snake's head into the tube with a hook (you may use a stick if you don't have a hook). If you have a fast-moving species, cap the farther end of the tube. It won't be a problem though, if you have a rattlesnake. Before the snake moves all the way through the tube, grasp the snake's body firmly but gently where the body meets the tube. Restrain the rest of the snake's body with the other hand. In real life, it's important that the restraining tube is exactly the right size. A tube that is too small may cause the snake to get stuck. A tube that is too large may allow the snake to turn around and bite the handler. Don't worry, though, our rubber snakes won't bite. With a long syringe, go through the side of your snake's mouth to avoid the glottis (vocal cords) in the center, and pretend to inject your medicine. Place the snake with the tube into a box and, while one person retains the snake with a hook or tongs, have the other remove the tube with the forceps. Quickly close your box.

5. After asking a ranger in advance, and signing up as a Cabrillo volunteer-for-a-day, educate the public about the importance of rattlesnakes in our community. Take what you learned, and create a poster or presentation that we can show to Park guests, or that you can present in your community.

6. Research how venom can be used for medicine, explaining the positive side of the toxin. Rattlesnake venom has been beneficial in treating many neurological disorders as well. According to Popular Science, "venom from rattlesnakes contains a chemical called crotoxin. Crotoxin is toxic to cells, but it only works on particular kinds of cells—in snake venom, those are in the blood and muscles. Researchers harnessed the unique combination of targeting and toxicity in crotoxin to create a cancer treatment, called CB24, which finds and kills tumor cells that are growing out of control. Initial trials seemed promising, though CB24 is not yet commercially available (its last clinical trial was in 2002)." Proteins in snake venom have developed side-by-side over millions of years to work efficiently in mammalian bodies, and scientists are just now starting to use the lock-and-key model in medicine. At home, do an independent research project on a rattlesnake subspecies.

7 . Make "venom" with squeezed pineapple, and see the effects of viper venom on "blood," made from gelatin. Take two cups, and label one "Regular Blood" and the other cup "Viper Bite". Take fresh or frozen pineapple pieces (cannot be canned!), and squeeze and mash them until you get a few cups of juice for the group. This juice will act as your viper venom. Follow the directions on the package to make quick set gelatin, and pour half of the warm gelatin into each clear cup. Inject the "venom" shallowly into the cup marked "Viper Bite" and stir with the dropper. Have each Scout or pair of Scouts add different amounts of venom, and take note of how many droppers they added, to see the effect of different amounts of venom. Set both cups in a safe place to cool. Check on them in 30 minutes. What do you notice?

Imagine the gelatin was your blood. Normally, if you get bitten by an animal so hard that you bleed, your blood thickens, forming a clot, so you don't lose too much blood. You can see this in the cup marked "Regular Blood". Rattlesnake venom has an enzyme (a type of chemical protein that makes chemical reactions happen much faster than they normally would) that stops blood from clotting. Normally, blood clots occur when a protein in our plasma, fibrinogen, is broken down by the enzyme thrombin into fibrin, which forms clots. The snake venom has many proteins to rapidly deplete all the fibrinogen, before our bodies can make more, so the body cannot clot. Not only does an animal bleed from the bite site, as venom travels through the body, it can cause bleeding from the eyes, gums, and internal organs. You can see this in the cup marked "Viper Bite". The enzyme in this experiment is a natural product from the pineapple called bromelain. Bromelain won't hurt you!