By the end of this class, we hope you will be able to

- Identify habitats preferred by reptiles at Bouverie Preserve and where to look for them,
- Recognize a few of the most common species of snakes and lizards at Bouverie Preserve,
- Tap into children’s natural fascination with reptiles and communicate respect for, rather than fear of, snakes and other reptiles,
- Understand and explain how Western Fence Lizards slow the spread of Lyme Disease,
- Model how to turn over and replace a rock/log safely when looking for reptiles and other critters,
- Understand why baby fence lizards are referred to as “nature’s French fries,”
- Have a “firm grasp” of reptile handling techniques, and
- Understand the protocol and how to respond when encountering a rattlesnake at Bouverie Preserve.
Resources

On-line
http://www.inaturalist.org/guides/2114/. Check out our continually updated on-line field guide to the Reptiles of Bouverie Preserve of ACR.

http://californiatherps.com/ This comprehensive independent site promotes public awareness, appreciation, and understanding of California’s indigenous reptiles and amphibians, and their natural habitats and includes pictures, sound recordings, videos, maps and descriptions of behavior for reptiles and amphibians.

http://www.nbherps.org/ North Bay Herpetological Society provides a forum for the exploration of the natural history and captive ecology of reptiles and amphibians; explores conservation issues; and provides education and assistance to community groups, animal rescue and advocacy organizations, and pet stores.

In the Bouverie Library

Western Reptiles and Amphibians by Robert C. Stebbins (2003)


The Biology of Rattlesnakes edited by Hayes, et al. (2008). All you ever wanted to know about these remarkable and misunderstood creatures.

Trail Tip
“Bed and Breakfast”
Children are fascinated by holes they find on the trail. A hole may be the opening of a burrow for a rodent or a snake. Rather than simply tell your hikers this, when you come upon a hole, ask them who they think lives there. If they say “a snake,” ask them how they think the snake dug the hole. After they scratch their heads for a while, tell them that a rodent burrow can be a “bed and breakfast” for a snake. The snake eats the rodent that dug the hole and then takes it over as its own home.
Reptiles of Bouverie Preserve of ACR
8/15

Southern Alligator Lizard
*Elgaria multicarinata* ¹

Western Fence Lizard
*Sceloporus occidentalis* ²

Western Skink
*Plestiodon skiltonianus* ³

Ringneck Snake
*Diadophis punctatus* ⁴

Sharp-tailed Snake
*Contia tenuis* ⁵

Western Yellow-bellied Racer
*Coluber constrictor mormon* ⁶

Common Garter Snake
*Thamnophis sirtalis* ⁷

Gopher Snake
*Pituophis catenifer* ⁸

California King Snake
*Lampropeltis californiae* ⁹

Spotted Night Snake
*Hypsiglena ochrorhyncha* ⁶

Northern Pacific Rattlesnake
*Crotalus oreganus oreganus* ¹⁰

Northern Rubber Boa
*Charina bottae* ¹¹

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# Common Snakes and Lizards at Bouverie Preserve

## Northern Pacific Rattlesnake

- *Crotalus oreganus*
- Uses jawbone to sense ground vibrations
- Has “pits” on side of head to sense heat—can find prey even in the dark
- Tongue carries smells into mouth where they are “tasted”
- Adds new section to rattle every time it sheds its skin
- Females give birth to live young
- Baby snakes have neurotoxic venom to paralyze prey while adults have hemotoxic venom that breaks down flesh

## Gopher Snake

- *Pituophis catenifer*
- Relatively large snake; 2-3 feet long
- Mimics rattlesnake when threatened; hisses and vibrates tail; often mistaken, but head not triangular like rattlesnake
- Kills by constricting its prey
- Typically seen basking across a trail motionless
- Has only one lung; ¾ length of body (like garter and king snakes)
- Single row of belly scales the width of its body

## Common Garter Snake

- *Thamnophis sirtalis*
- When captured, will defecate or eject foul smelling musk from anal glands
- Females give birth to live young
- Often called “garden” or “water” snakes because of their occurrence near those places
- Utilizes a variety of habitats - forests, mixed woodlands, grassland, chaparral, farmlands, ponds, marshes, or streams
- Eats a wide variety of prey, including amphibians and their larvae, fish, birds, and their eggs, small mammals, reptiles, earthworms, slugs, and leeches; Able to eat adult Pacific newts (*Taricha*) which are deadly poisonous to most predators

## King Snake

- *Lampropeltis californiae*
- Medium to large, 2 ½ - 3 feet long
- Color variable; most often alternating bands of brown or black and white.
- Eats a wide variety of prey, including rodents and other reptiles, including other snakes.
- Immune to rattlesnake venom; eats rattlesnakes
- When threatened, rolls into a ball and exposes red inside of vent.
| **Ringneck Snake**  
<table>
<thead>
<tr>
<th><em>Diadophis punctatus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Secretive - usually found under Rocks, wood, or other surface debris; occasionally seen moving on the surface on cool days, at dusk, or at night.</td>
</tr>
<tr>
<td>• When disturbed, coils like a corkscrew, exposing tomato red underside;</td>
</tr>
<tr>
<td>• Fun to hold but may smear musk and cloacal contents.</td>
</tr>
<tr>
<td>• Eats slender salamanders and other small salamanders, tadpoles, small frogs and snakes, lizards, worms, slugs, and insects; mild venom may help to incapacitate prey.</td>
</tr>
</tbody>
</table>

| **Sharp-tailed snake**  
<table>
<thead>
<tr>
<th><em>Contia tenuis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Small; adults average 8-12 inches, hatchlings only 3 inches; sometimes mistaken for worms</td>
</tr>
<tr>
<td>• Found in cool wet weather, after rain, under rocks and other surface debris</td>
</tr>
<tr>
<td>• Eats slugs, slug eggs, and slender salamanders</td>
</tr>
<tr>
<td>• Long teeth allow the snake to hold on to its slippery prey</td>
</tr>
</tbody>
</table>

| **Western yellow-bellied racer**  
<table>
<thead>
<tr>
<th><em>Coluber constrictor mormon</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Active in daylight; harmless to humans</td>
</tr>
<tr>
<td>• Typically under 3 ft., but adults can grow to 75 inches long!</td>
</tr>
<tr>
<td>• Moves very fast; hunts with head held above ground, moving side to side</td>
</tr>
<tr>
<td>• Despite name, not a constrictor; kills prey by crushing with jaws or pinning under body and consuming alive</td>
</tr>
<tr>
<td>• Eats lizards, small mammals, birds, eggs, snakes, small turtles and frogs, and large insects.</td>
</tr>
<tr>
<td>• Young have dark blotches on side and saddle marks on back; once thought to have been a different species</td>
</tr>
</tbody>
</table>

| **Northern rubber boa**  
<table>
<thead>
<tr>
<th><em>Charina bottae</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Very docile, will only exude nasty smell if really bothered</td>
</tr>
<tr>
<td>• Slow moving even when warm</td>
</tr>
<tr>
<td>• Crepuscular/nocturnal</td>
</tr>
<tr>
<td>• Is best found when temperature is between 65-75 degrees F.</td>
</tr>
<tr>
<td>• Can tell males from females by spur at vent</td>
</tr>
<tr>
<td>• Dying snake “act” startles predators</td>
</tr>
</tbody>
</table>
| **Night snake**  
*Hypsiglena ochrorhyncha* | - Most often seen crossing back roads at night  
- Small with triangular shaped head; often confused with baby rattlers but tail tapers to a point  
- Has a pair of dark brown or black blotches on neck behind head  
- Harmless to humans, but kills prey with set of enlarged grooved teeth with mild venom |
|---|---|
| **Western Fence Lizard**  
*Sceloporus occidentalis* | - Most commonly seen reptile in Bay area; often called “blue-belly”  
- Have “third eye” on top of head that regulates color changes in response to light and when to get out of the sun  
- Males territorial, do “push-ups” to show off to females and to defend their turf  
- Males expose blue belly and may change color when courting  
- During mating, male grabs female’s neck in jaws; has two “hemipenes” to inject sperm into female  
- Eggs deposited in ground; young never see parents  
- Blood of this species kills the bacteria in ticks that causes Lyme disease! Look for ticks and mites around neck. |
| **Southern Alligator Lizard**  
*Elgaria multicarinata* | - Has thick heavy scales reinforced with bony plates  
- Has large folds of “extra” skin on sides to allow expansion after eating  
- Be careful if handling: tails break off readily and has strong jaws to inflict painful bite.  
- Both Southern and Northern species occur in Sonoma County, but the latter in cooler places.  
- Southern lays eggs; northern gives birth to live young. |
| **Western Skink**  
*Plestiodon skiltonianus* | - Smallish lizard; usually skinnier than fence lizards  
- Distinct stripes running down sides  
- Startlingly bright blue tail; brighter and bluer in younger skinks.  
- Readily sheds tail if captured  
- Very quick; you are most likely to just catch a glimpse as it scurries under rock or woodpile or hear it rustling the grass in search of insects  
- Active mostly in late afternoon |
Frequently asked questions about reptiles and their kin

What is a reptile?
Reptiles are cold-blooded vertebrates (animals with backbones) with bodies covered in dry horny scales. Some reptiles lay eggs; others give birth to live young. Reptiles generally see and hear well. Their bodies are low to the ground and, with the exception of snakes and some lizards, they all have four legs. Even though not evident today, even these “legless” reptiles show morphological traits indicating they once had legs too.

So, what is a “herp”?  
Herpetology is the branch of zoology that studies amphibians and reptiles (The name is derived from the Greek word herpeton or "crawling things."). “Herp” is a nickname for any one the many animals belonging to the three main groups of amphibians or the four groups of reptiles. However, although reptiles and amphibians evolved from a common ancestor millions of years ago, the two groups are not closely related.

Reptiles and amphibians are divided into the following sub-groups.

**Amphibians**
- frogs and toads
- salamanders
- caecilians (little-known animals that look like worms)

**Reptiles**
- snakes and lizards
- crocodiles
- turtles and tortoises
- tuataras (little-known reptiles that live on islets off the coast of New Zealand)

So, what is the difference between reptiles and amphibians?
Amphibians were the first group of vertebrates that evolved to live on land (at least for part of their lives), but reptiles were the first “true” land vertebrates because they developed an amniotic egg. Definition: amniotic egg = an egg with compartmentalized sacs (a liquid-filled sac in which the embryo develops, a food sac, and a waste sac) that allowed vertebrates to reproduce on land.
The key similarities and differences of the two groups are:

<table>
<thead>
<tr>
<th>Similarities</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Both are ectothermic (cold-blooded)</td>
<td>✦ Amphibians usually lay unshelled eggs in water, while those reptiles that lay eggs lay shelled eggs on land.</td>
</tr>
<tr>
<td>✦ Both usually shed their skin several times a year.</td>
<td>✦ Most juvenile amphibians live in water for some time after hatching, breathing through gills.</td>
</tr>
<tr>
<td>✦ Many reptiles and amphibians have special cells that cause the color of their skin to lighten, darken, or change altogether.</td>
<td>✦ Young reptiles often resemble adults while baby amphibians often don’t look much like their parents. Young amphibians gradually change into their adult forms through the process of metamorphosis.</td>
</tr>
<tr>
<td>✦ Many have an organ in the roof of the mouth, called the Jacobson’s organ, that senses odor particles.</td>
<td>✦ Adult amphibians that live on land are restricted to damp areas as their skin must remain moist at all times. Their skin produces a coating of mucus that keeps them from drying out. Reptiles have scales or plates covering dry skin.</td>
</tr>
</tbody>
</table>

How are reptiles related to other animal groups?

A. Traditional view (based on common ancestors and physical traits):

![Image of a diagram showing the relationship between birds, reptiles, mammals, crocodilians, lizards and snakes, and turtles. All are vertebrates with amniotic eggs.](image-url)
B. Cladistic view (based on shared derived traits, not necessarily physical similarities):

So, in this system of classification, crocodiles actually have more in common with birds than with lizards!

What are the main differences between snakes and lizards?

<table>
<thead>
<tr>
<th>Snakes</th>
<th>Lizards</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Evolved from lizards (about 200 million years ago)</td>
<td>✦ Have been around longer than snakes</td>
</tr>
<tr>
<td>✦ Have no eyelids, but do have a transparent shield that protects the eye; do not blink</td>
<td>✦ Most have eyelids and blink (but some have shields like snakes)</td>
</tr>
<tr>
<td>✦ No legs (although vestigial)</td>
<td>✦ Most have legs, a few do not</td>
</tr>
<tr>
<td>✦ Shed their skin at one time</td>
<td>✦ Shed skin in patches</td>
</tr>
<tr>
<td>✦ Tend to have a longer body than tail (body measured from head to vent)</td>
<td>✦ Tend to have long tails relative to body size (body measured from head to vent; tail from vent to tip of tail)</td>
</tr>
</tbody>
</table>
The Western Fence Lizard is the most common reptile in the Bay Area. Also called "blue bellies," males perform push-ups in territorial displays. I found this one in Briones Regional Park, hiding under a fallen fence post—a blue jewel on a dry, late-summer day. The instant I released him, he vanished in a scuttling blur.

Only males have two large "D" shaped scales below their vent.

Tails are adapted to snap off in a predator's claws then slowly regenerate—handle with care.

Ticks (black) feed on blood through vulnerable skin near lizards' ears or leg joints. The lizard's blood kills the bacteria that causes Lyme disease, cleaning the tick of the disease.

Mites (red) in the skin can create sores and infections. Males are generally darker than females.

Lizard skin is darker in the morning to help collect heat.

A third eye on the top of the head helps the lizard know when it has been out in the sun too long.

Special scales on the thigh leave scent marks on rocks & logs.

Coarser scales on feet provide traction.

Drawn to Scale
The Western Fence Lizard

By Jack Laws
A Closer Look

On any sunny spring day in the Bay Area, take a moment to look at a large rock, or a fallen tree, you should be able to find a western fence lizard. These are the familiar “blue-bellied lizards”, whose habit of basking in the sun makes them such a prominent part of our outdoor experiences. If you take a few minutes to stop and watch these creatures, you may see that their lives involve much more than just sitting in the sun, waiting for a fly to arrive.

At first glance, these lizards look like a dull colored extension of the gray rocks or log on which they rest, but a closer examination reveals a mosaic of color, which can change dramatically in response to a variety of situations. Have you ever noticed that black lizards seem to be replaced by brown lizards at different times of the day? This is actually a case of the fence lizard’s ability to adjust the color of its skin to regulate the amount of heat absorbed. During cooler mornings (or cloudy afternoons), the lizard adjusts the pigment cells in its skin to make it entirely black, therefore allowing it to absorb more solar radiation. As the day warms, the lizard can adjust its color to a lighter shade, to reflect more sunlight. These color shifts are necessary to allow the lizard to maintain a relatively stable body temperature, which is roughly the same as that of a typical “warm blooded” animal, about 97-99 degrees Fahrenheit. This process is governed by a network of tubes in the top of the lizard’s head sometimes called the “third eye”. If you look closely at the top of a fence lizard’s head, you will see a tiny dot in the middle of the large scale behind the eyes. This dot is called the parietal eye; it has a retina, a lens and a cornea. The corneal cells interact with the part of the brain that regulates color control and activity, thus the lizard has an automatic control mechanism that tells it when to adjust the skin color, and when to come out in of the bright sun.

During the breeding season (March through June in our area) male fence lizards engage in visual displays to fend off rival males and to attract potential mates. During these displays a male will arch his back and inflate his abdomen while bobbing his head and executing a series of jerky “push-ups”. These movements and posturing result in the display of the brightly colored blue patches on the belly and throat. A displaying male may also change the pigment of the scales on his flanks, his upper tail and even across his back to patterns of turquoise, blue, and green. These intense color shifts can take place in a matter of seconds, particularly during mating or when two similar sized males face off.

Female fence lizards may share a basking site with a male, particularly during early spring. It is not uncommon to see two lizards perched close to one another; the male often tries to have some physical contact with the female. During mating the male grasps the female’s neck in his jaws and then uses one of his hemipenes (that’s right, male lizards have TWO organs!) to transfer sperm to the female. A female often mates with more than one male each season, thus ensuring some genetic diversity in her offspring. A healthy female usually produces 6-12 eggs in mid to late spring. She excavates a shallow nest where the soil is slightly damp and contains a mix of soil and organic matter. She buries the eggs and then departs; there is no contact between the parents and the young when the eggs hatch in mid-summer.

Newly hatched fence lizards are miniature replicas of their parents, seldom measuring more than an inch from snout to base of the tail. In late July and early August, these tiny lizards are commonly seen scampering along the edges of trails and roads. They feed on small insects and spiders until the first cold weather of autumn when they head into abandoned rodent burrows or other sheltered locations. They remain in hiding until the first warm days of spring, when they emerge to begin their first full season of growth. During their first spring and summer they spend their time on the perimeter of territories occupied by adults. If they are successful they will attain full adult size by the end of summer and will be able to breed the following spring.

One of the remarkable attributes of the western fence lizard (and our two local species of alligator lizards) is their effect on the spread and transmission of Lyme disease. Young ticks often feed on lizards, in fact it is unusual to find a lizard without at least a half dozen ticks attached to the fold of skin just behind their ear opening. The blood these ticks take from lizards contains a protein that kills the Lyme disease bacteria (if present), and prevents the tick from harboring the disease even if it takes its next meal from an infected host. The lizards are effectively vaccinating the ticks against the disease. Because the Bay Area has healthy populations of these particular lizards, we enjoy a relatively low rate of Lyme disease (about 5% of all ticks sampled here are carriers). In the Northeastern states, (outside of the range of these lizards) samples show that as much as 50% of the ticks are carriers.

David Herlocker is the Naturalist for the District. He is responsible for the Naturalist Walks Program, which is offered as an educational resource for the people of Marin County. For information on the program, contact David at (415) 499-3647, or by e-mail at: dherlocker@co.marin.ca.us. You can also get information on the walks schedule and the Open Space District on the web at: www.marinopenspace.org.
An update on the science of ticks and Lyme disease

Tick population plummets in absence of lizard hosts
By Sarah Yang, Media Relations | February 15, 2011

Article taken from UC Berkeley NewsCenter - http://newscenter.berkeley.edu
Link to article: http://newscenter.berkeley.edu/2011/02/15/ticks-lizard-lyme-disease/

A Western fence lizard (Sceloporus occidentalis) can often be found with dozens of ticks attached to it. However, they have a unique influence on the ecology of Lyme disease. The lizard's immune system clears the Lyme disease bacteria from ticks after the ticks feed on the lizard. (Anand Varma photo)

The Western fence lizard’s reputation for helping to reduce the threat of Lyme disease is in jeopardy. A new study led by researchers at the University of California, Berkeley, found that areas where the lizard had been removed saw a subsequent drop in the population of the ticks that transmit Lyme disease.

“Our expectation going into this study was that removing the lizards would increase the risk of Lyme disease, so we were surprised by these findings,” said study lead author Andrea Swei, who conducted the study while she was a Ph.D. student in integrative biology at UC Berkeley. “Our experiment found that the net result of lizard removal was a decrease in the density of infected ticks, and therefore decreased Lyme disease risk to humans.”

The study, to be published online Tuesday, Feb. 15, in the journal Proceedings of The Royal Society B, illustrates the complex role the Western fence lizard (Sceloporus occidentalis) plays in the abundance of disease-spreading ticks.

Lyme disease – characterized by fever, headache, fatigue and a bullseye rash – is spread through the bite of ticks infected with spirochete bacteria called Borrelia burgdorferi. In the Western region of the United States, the Western black legged tick (Ixodes pacificus) is the primary vector for Lyme disease bacteria.

In 1998, a pioneering study led by UC Berkeley entomologist Robert Lane found that a protein in the Western fence lizard’s blood killed Borrelia bacteria, and as a result, Lyme-infected ticks that feed on the lizard’s blood are cleansed of the disease-causing pathogen. Moreover, research has found that up to 90 percent of the juvenile ticks in this species feed on the Western fence lizard, which is prevalent throughout California and neighboring states.

The lizard is thus often credited for the relatively low incidence of Lyme disease in the Western United States. The new UC Berkeley-led study put that assumption to the test experimentally.

“When you have an animal like the Western fence lizard that supports such a huge population of ticks, you can’t assume that all those juvenile ticks will go to another host if the lizard population drops,” said Lane, UC Berkeley Professor of the Graduate School and co-author of this study.
For their field test, the researchers selected 14 plots, each measuring 10,000 square meters and spread out over two sites in Marin County, Calif. Half the plots were located at China Camp State Park, and the other half were at the Marin Municipal Water District Sky Oaks headquarters. The researchers had already been extensively surveying tick density in those plots over the course of two years, so they had detailed data on tick and vertebrate populations before this experimental field trial.

UC Berkeley’s Andrea Swei studies how ticks and their hosts interact to affect the incidence of Lyme disease in California. Here, she checks a deer mouse for ticks. (Anand Varma photo)

From March to April 2008, before tick season went into full swing, the researchers captured and removed 447 lizards from six plots – three at each site – and left the remaining plots unaltered as controls. The lizards that had been captured were marked before being relocated so the researchers could determine whether any wandered back into their old haunts.

After the lizards were removed, the researchers spent the following month trapping other mammals known to harbor ticks – particularly woodrats (Neotoma fuscipes) and deer mice (Peromyscus maniculatus) – to determine whether they bore an uptick in ticks as a result of the lizards’ absence. The researchers also checked for differences between control and experimental plots in the abundance of host-seeking ticks by systematically dragging a large white flannel cloth over the ground.

The researchers found that in plots where the lizards had been removed, ticks turned to the female woodrat as their next favorite host. On average, each female woodrat got an extra five ticks for company when the lizards disappeared.

However, the researchers found that 95 percent of the ticks that no longer had lizard blood to feast on failed to latch on to another host.

“One of the goals of our study is to tease apart the role these lizards play in Lyme disease ecology,” said Swei, who is now a post-doctoral associate at the Cary Institute of Ecosystem Studies in New York. “It was assumed that these lizards played an important role in reducing Lyme disease risk. Our study shows that it’s more complicated than that.”

Notwithstanding the results in this new study, Lane pointed out that the Western fence lizard are key to keeping infection rates down among adult ticks. “This study focused only on the risk from juvenile ticks, specifically those in the nymphal stage,” he said. “The earlier finding that adult ticks have lower infection rates because they feed predominantly on the Western fence lizard at the nymphal stage still holds.”

“In attempting to decrease infectious disease risk, we need to remember the law of unexpected consequences,” said Sam Scheiner, program director in the National Science Foundation Division of Environmental Biology, which funded the research through the joint NSF-NIH (National Institutes of Health) Ecology of Infectious Diseases Program. “This study demonstrates the complexity of infectious diseases.”

- Other authors on this study are Cheryl Briggs, a professor at UC Santa Barbara’s Department of Ecology, Evolution and Marine Biology; and Richard Ostfeld, a senior scientist at the Cary Institute of Ecosystem Studies.

(Note from JW: Researcher Andrei Swei collected some of her data right here at Bouverie!)
Alligator Lizards
Prepared by Gwen Heistand

There are two species in our area: Northern (*Elgaria coerulea*) and Southern (*Elgaria multicarinata*). How can we tell them apart?

**Northern** alligator lizards give live birth. **Southern** alligator lizards lay eggs. (N. Alligator Lizard, Garter Snakes, and Rattlesnakes are all live bearers.)

**Northern** Alligator Lizard has lines of grey running **between** the scales of the belly.

**Southern** Alligator Lizard has lines of grey running down the **middle** of the belly scales.

**Northern** alligator lizard has **dark around its pupils**.

**Southern** alligator lizard has **light around its pupils**.

What else about alligator lizards?
Alligator lizards have **armored plates**. It’s really easy to feel the very hard surface under the lizard’s skin. However, when you’re full of food, full of babies, and full of oxygen, you need to be flexible and able to expand. So there is an **area where there are small granular scales** along the lizard’s side. If you’re ever lucky enough to have an alligator lizard in hand, it’s possible to watch the lizard breathe!
The heads of males are more arrow-shaped because jaw musculature is so heavy. When a lizard opens his mouth it’s possible to see the masses of muscles. This can hurt. They kill their prey by crushing.

The tail is partially prehensile. If the lizard is relaxed, it is sometimes possible to get it to move from hand to hand using its tail. At one herp handling class, we watched the lizard repeatedly wrap its tail around David Herlocker’s finger. Alligator lizards give up their tail really easily – so you don’t want to handle them in the afternoon (after it’s warmed up) or hold them by the tail.

Alligator lizards are thigmotherms, meaning they get their heat from their surroundings. This is why they like darkly colored logs and are found under or near them. They can be seen foraging out in the open in the morning and evening. They’re mostly fossorial. They’re active during the day and inactive during cold periods in winter. They move with a snake-like undulation. They are also good swimmers.

Alligator lizards are preyed on by birds, foxes, raccoons, coyotes, king snakes – things that can turn over or get under logs, etc.

It’s possible to find nymphal ticks on them. There are chemicals in the blood of the N. & S. Alligator Lizards and Western Fence Lizards that kill the spirochete that causes Lyme disease found in the tick Ixodes pacifica. This renders the tick incapable of transmitting the disease. Ticks always accumulate along folds where there is no armor and in the ears.
Guidelines for Handling Herps (Lizards, Newts, Snakes…)
Prepared by Gwen Heistand
with tons of help from David Herlocker

Watching the expression on a child’s face (or an adult’s for that matter) as they hold a newt or a lizard or a frog for the first time is truly a wonderful thing. The sense of connection to something other and something living touches a place in just about everyone that is close to my definition of magic. It is not necessarily magical for the critter that’s being held. I have been asked to remind folks that there are some ways to enjoy that moment of contact that are less stressful for the animals we’re admiring. Most of this you know … and I always like to remind myself from time-to-time.

Before we even get started on this … I sometimes like to make the analogy to kids that when you scoop a newt out of the water or capture any other critter, it is like being at home, hanging out in your bedroom and having someone lift the roof off of your apartment building or house and just spirit you away from everything feels safe or comfortable. Just because you know you’re not intending to harm the critter, doesn’t mean the critter knows this. The animal has no idea that the freaky thing happening to it isn’t for the rest of its life or a matter of life and death. Anything we can do to make our wonderful experience as un-traumatic as possible for the creature we’re observing is good thing. So here are some guidelines for handling herps with many, many thanks to David Herlocker!

Remember, with all of these creatures (except snakes) it is preferable they be placed in a clear plastic container after capture. Once in the container, they can be passed around, studied, and discussed.

Lizards:
The first thing to remember is that lizards store fat – which is energy for them – in their tails. I’ve heard folks say that it’s okay if lizards’ tails fall off when they are caught because the tails grow back. This is a very, very expensive proposition for a lizard. Autotomizing a tail is something that is done as a last resort. What might be some of the ramifications to a lizard of losing a tail? (Without that stored energy, lizards need to eat more. The lack of tail may impair their ability to get a mate … Ask the kids to think about this.)

- **Western fence lizards**, especially when they are warmed up (which is often when the kids see them) aren’t good candidates for hand capture. Grabbing them requires a quick grab – too slow and you get the tail, too fast and you can break the lizard’s bones (particularly the pelvis) with the hand slap. The preferred method of capture is by the use of a noose.
- **Alligator lizards** are usually slow enough for hand capture AND should only be body grabbed.. However, watch out because they usually turn and bite. (Alligator lizards have a very narrow head and “shoulder” area, so the noose slips right off of them.)
- **Skinks** should only be hand caught when they are found under objects (i.e. when they’re cold and sleepy). Skinks have by far the most fragile tails and are expert at leaving you holding nothing else. (If you are lucky enough to see the beautiful skink at Henderson Overlook, you will notice that it is now missing much of its lovely blue tail.)
Newts:
- Make sure **hands are clean** of sunscreen, lotions, etc.
- Make sure **hands are wet**
- **Hold newts low and over the water** (tub, stream, trail, or pond). This is to prevent trauma if this live animal, in some degree of panic from being held, manages to work its way free. If a kid stands up or is not paying attention, you can gently remind them that a newt is about 3 inches long and maybe an inch high. If a 4 foot kid stands up to hold the newt 2 ½ to 3 feet off the ground and the newt wiggles free and falls, that is like us falling off a 15 story building. (Of course, newt bones are softer and not as breakable **and it is still** traumatic.)
- When you are **talking about the newt and passing it around for observation**, it is always best to **put the newt in a clear, plastic container**.
- If the newt seems distressed, put it back. Period.
- Have kids rinse or wash hands afterwards.

The same applies when handling other salamanders. However, other salamanders are often found by rolling logs. (See log rolling etiquette at the end.)

Frogs:
- Most of the frogs you will deal with are treefrogs. They can be **caught by gently cupping your hands around** them (not grabbing them by the legs or body).
- They’re too small for “show and tell” handling – they hop away and they can’t be gripped between the fingers. (Have you ever seen a frog skeleton? They don’t have ribs … they work like a giant airbag, puffing up to absorb the blow when they land after hopping.) You can usually hold medium or large frogs by “pinching” them between two fingers. We don’t often see medium to large frogs at BLP. It’s recommended that (can you guess?) **frogs are always displayed in a clear plastic container**.

Snakes:
- Like lizards, the consequences of grabbing a snake will differ according to the type of snake, and the time of day.
- Most of your encounters will be with **garter snakes** which can be grabbed two-handed (one at mid-body, one at the very tip of the tail). This way you don’t get too badly smeared with the musk. The musk is part of a good story though.
- **Racers**: grab anything you can catch, control the head quickly. They will injure themselves by violent thrashing if not restrained properly.
- **Ringneck snakes**: grab anywhere.
- **Gopher snakes**: tough to generalize, some bite, some don’t. If the snake is warm (exposed on a sunny day) it’s best to grab at the neck and calm the snake down before releasing the head. Sometimes David nudges the snake with his toe to see how it responds: if it assumes a defensive pose he assumes it will bite, if it just recoils slightly, he might just lift it gently at mid body to keep it calm for show and tell. If he gets a really calm gopher snake, he encourages the timid people to touch and hold it. This is a great snake-phobia remover.
- **Where to look**: You can catch garter snakes any day in spring by the pond. If you have somebody walk along the perimeter of the pond about six feet from the water’s edge and you follow about a pace behind, right at the water’s edge, you have a good chance of intercepting garter snakes heading for the water as they flee the other person. The edges of all of our meadows are good snake hunting territory. Gopher snakes can often be found in, around, and under old wood piles.
Noose Construction and Use (from Stebbins, *Western Reptiles and Amphibians*):

- Make a slip noose of thread, grass (wild oats works well) fishing line or copper wire, depending on the size of the animal. Unwaxed dental floss works well for our lizards.
- Make a small loop (1/4 inch diameter) at the end of a thread. Tie the loop with a square knot so it will not close. Pass the shank through the loop and attach it to a stick or fishing pole. (The shank should be short, no longer than 6 inches, to avoid getting it tangled or blown.)
- Should the noose tend to close when in use, open it to the desired diameter and use saliva to moisten both loop and shank where they come into contact.
- When noosing a lizard, avoid quick movements. When the noose is within 5 or 6 inches of the head, move it slowly or pause for a moment, allowing the animal to become accustomed to the presence of a strange object nearby, then move the remaining distance gradually.
- When the noose passed over the lizard’s head and has reached the neck region, jerk upward and slightly backward. Remove the animal quickly, before it has a chance to wriggle free.
- Wary species can sometimes be noosed by creating a diversion. Gently shake a handkerchief at arm’s length to one side or wriggle your fingers to attract attention away from the noose.
- Noosing rarely does harm. Support the body weight of heavier lizards by resting their hindquarters on the ground after capture and before the noose is removed.

Log-Rolling etiquette

- If the log looks like it will easily break up, leave it where it is. What is this about? That log is habitat to host of things … the things that are helping to break it down, the things that are living under it and in it. If a log like this is moved, it is like taking out a village.
- Stand behind the log and roll it so that the opening is facing away from you. Why?
- Have someone(s) watching the log and its under parts when it is rolled, ready to gently capture what is underneath. If you are lucky enough to find an enstatina or a slender salamander, please place the critter in a clear plastic container to pass it around for observation. Remember that slender salamanders may never leave a particular log for their entire life. It is their home.
- When you replace the log, do not put critters you have found back where you are going to roll the log. Place them just to the side or edge of the log after it is back in place. This will keep them from getting crushed. They will find their way back under the log.

This is a lot of information. It is my hope that we can begin to incorporate more and more of these practices into the way we work with kids, conveying the excitement of responsible capture, the thrill of contact, and a sense of respect and understanding of the animals we catch. As David Herlocker says, “This is such a tough issue, ask any grown up herpetologists and you will hear childhood stories of hand grabs and tails lost, but these stories also convey a subtle message: these hand held lizard moments were transformational – that’s why these individuals grew up to be biologists.”
Lizard Capture with Noose

A lizard ready for noosing

Noose attached to end of fishing pole. Approach slowly; avoid sudden movements.

Slowly approach the lizard with the noose. The lizard is watching for quick movements.

Once the noose is around the lizard’s head, pull up.

The noose does not hurt the lizard and is a much safer way to handle western fence lizards.

When handling lizards hold them firmly and gently. It is possible to pass them this way from one person to the next.

It’s possible to show the underside and point out salient features while the lizard is in the air. Also, it’s easy to rest the lizard on your arm and talk about it there.
Rattlesnakes have wonderful senses that help them to hunt. Using their senses, they can find prey at any time of the day or night. They can even locate warm-blooded animals in complete darkness!

When we humans want to find something, we use our eyes and ears the most. Rattlesnakes have eyes and ears, and they sometimes use them to find prey. But they mostly use their sense of smell and their sense of heat to hunt.

All rattlesnakes are pit vipers. This means that they have special openings called pits on their faces that can feel heat. Even in complete darkness, the pits can "see" the heat that is given off by the bodies of warm-blooded animals. The animals can try to hide by staying still and quiet—but the heat from their bodies gives them away.

The ears of a rattlesnake are inside the head. There are no ear openings on the outside.

To hear, rattlesnakes use their jawbones! They rest their jaws on the ground to pick up vibrations that are made by animals (or people) that are moving nearby. The jawbone carries the vibrations to the ear inside the head.

To smell, a rattlesnake uses its tongue. The moist tongue is flicked out to pick up smells from the air and ground. Then the tongue carries the smells into the mouth, where they are "tasted" by a special sense organ called Jacobson's organ. A rattler can also use its nostrils for smelling.
Using their pits, rattlesnakes can find the exact location of prey in the dark. To do this, they move their heads from side to side. The heat on either side of the prey is less hot than the heat coming directly from the warm body.

The snake finds the hottest spot—and that is where the prey can be found.

Rattlesnakes can see well only at short distances—up to 15 feet. All rattlesnakes have large eyes with pupils that can be opened very wide to help them see in dim light. There are no eyelids on the eyes—so when rattlesnakes sleep, their eyes stay open!

The bodies of warm-blooded animals give off heat.

The pits on a rattlesnake's face can feel the heat.
Because the body of a snake is long and thin, the available space for organs is limited. As a result, some organs are reduced in size or missing altogether. For example, most snakes have one large lung and one tiny lung. Sometimes, they have only a single lung.

**How a Snake Gets Out of Its Skin**

Then, by rippling the muscles of its body, the snake stretches the outer layer of skin and begins to wriggle out of it.

The snake begins by rubbing its head against something hard until the skin splits open.

In the process, the outer layer of skin is turned completely inside out. It is usually shed in one piece.

*From Zoobooks 14(4), January 1997*
RATTLESNAKE PROTOCOL

What to do if you encounter a Rattlesnake at Bouverie Preserve

Northern Pacific Rattlesnakes live throughout northern California and occupy habitats at the Bouverie Preserve that occasionally bring them in contact with hikers. No hiker has ever been bitten by a rattlesnake at the Bouverie Preserve. One reason for this excellent safety record is that Docents learn and follow a set of procedures that provide maximum safety to themselves and their hikers. These procedures also allow hikers to learn about, appreciate, and respect rattlesnakes, thereby preparing them for future encounters. Most snakebites occur when humans harass or try to kill rattlesnakes.

Stay on the Trail
1. Stay at least 6 feet back. Rattlesnakes can strike about one-half the length of their bodies. A six foot margin reduces stress on the snake and keeps hikers well out of reach.
2. If the snake is blocking a trail, wait for it to go on its way before proceeding. NEVER attempt to get the snake to move or rattle by yelling, clapping, or poking it with a stick.
3. If a rattlesnake is blocking a trail and does not move after a short period of time, go back the way you came and take an alternate route. Advise other docents that a snake is on the trail.

Be Alert and Aware of Their Habitat
1. During warm weather, snakes seek cool places under rocks, logs, or human structures. When rolling a log or rock to look for critters, ALWAYS roll it facing away from your body.
2. Always check the Bark House for rattlesnakes before entering with hikers. Rattlesnakes have been spotted both inside the Bark House and on the outside, hiding under pieces of bark. If a snake is in or on the Bark House, DO NOT ENTER. Warn other docents that a rattlesnake has been seen. NEVER bang the outside of the Bark House with a stick. Banging is more likely to agitate a rattlesnake than scare it away.

In the Unlikely Event Someone is Bitten
1. Call 911.
2. If you do not have a phone or cannot get through, blow your whistle three times until another docent responds to assist you. If no phone is available, dispatch a docent to Gilman Hall to alert staff.
3. The most important thing to remember is that time is of the essence. The faster a bite victim is transported to emergency care, the better the outcome. If you are unable to reach anyone and are unsure of what to do, don’t wait. Walk or carry the victim back to Gilman Hall.
4. Try to keep the victim calm. Remove any jewelry or watches that may restrict swelling. If possible, wash the bite area with soap and water and/or apply a cold wet cloth over it.
5. NEVER apply a tourniquet or ice. NEVER cut the wound or attempt to suck out the venom. These treatments will not help the victim and may be dangerous. Improper application of ice or tourniquet can block arterial circulation which may result in gangrene or loss of limb. Cutting can cause excessive bleeding and sucking venom from the wound can cause infection, making treatment more difficult.
6. DO NOT PANIC. It is extremely unlikely that a Northern Pacific Rattlesnake bite victim will die. Statistically speaking, more people die from bee or wasp sting reactions. With the right care, most people survive their bites quite well. There are very few fatal Northern Pacific Rattlesnake bites.
ACR Bouverie Preserve
Docent Training

iNaturalist Homework Assignment

All trainees must successfully complete the following no later than October 4.
If you run into difficulty, please consult with staff &/or mentors in advance.

STEP BY STEP:

1. Create your own iNaturalist account on the iNaturalist website by clicking HERE or going to https://www.inaturalist.org/signup Use your email account and create a password.
   a. Please leave this box CHECKED: “Yes, license my photos, sounds, observations so scientists can use my data!”

2. ON YOUR MOBILE DEVICE: Go to the App Store, search for iNaturalist, download and open the iNaturalist app. Swipe through intro screens to reach login screen – at the bottom of the login screen, choose the option to log in to your existing iNaturalist account.
   NOTE: Please make sure you have updated the software on your mobile device. Sometimes folks run into problems when their software is not the most current.

3. FUN! GO OUTSIDE & SEE IF YOU CAN SUCCESSFULLY WALK YOURSELF THROUGH THE PROCESS OF MAKING A FEW OBSERVATIONS by following these instructions:

   **MAKING OBSERVATIONS with your iThingie or Andriod**
   1. Select & open iNaturalist on your device
   2. Log in to your account
   3. Select “Observe” (camera icon at bottom of screen)
   4. Take a picture of your observation
      NOTE: Select “Retake” until you are satisfied with your picture.
   5. Tap “Next”
   6. If you want to add more pictures of this organism, choose + at top left
   7. Tap “What did you see?”
   8. If you have an idea of scientific name (genus), start typing in search !
   9. If you have no idea, tap what you think it is from among suggestions.
   10. Tap “SHARE” at bottom of screen – When prompted, allow iNaturalist to access your location.

4. Don’t get frustrated if you can’t pull this off! If you need assistance, please consult with ACR staff &/or mentors (or one of your techie friends) so that you have successfully done this BEFORE the October 11 class.

*IF YOU DON’T HAVE A MOBILE DEVICE – THE PRESERVE HAS A FEW LOANER iPAD minis. Contact Julia before September 27 if you need to use one to do this homework.*
5. After you’ve successfully used your device to make a few observations (way to go!), go back to your computer, log into your iNaturalist account, and follow these instructions:

**ACCESSING & EDITING OBSERVATIONS**

1. Log into iNaturalist on your computer
2. Hover over “Observations” at top of page & choose “by you” from the dropdown menu. You should see your observations.
3. You may add notes or additional information (captive/cultivated?) by clicking “edit” on any given observation.

6. ON YOUR COMPUTER: Join the project called “Bouverie Preserve of Audubon Canyon Ranch – Bioblitz” and:
   a. Click on “Projects” at the top of the page
   b. Type “Bouverie” in the search box
   c. Click on “Bouverie Preserve of Audubon Canyon Ranch – Bioblitz”
   d. Select “Join This Project” at top right of page
   e. Under the heading “OTHER” – Decide whether you want to receive daily updates and select “Yes, no matter who adds observation to the project.”
   f. Click on “Yes, I want to join”

7. Once you’ve joined the Bouverie Bioblitz, click on the dots & drop pins on the project map to view the species we’ve observed & identified. The drop pins show recent observations – click on any pin to explore observations.

![Map with drop pins](image)

- Green = Plants
- Blue = Mammals, fish, birds, reptiles, amphibians
- Red = Insects, spiders, mollusks
- Purple = Fungi

8. CELEBRATE!!! YOU DID IT!!!