

Elementary Educators Resource Guide to Herpetology in Minnesota

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Why is it important to study herpetology?

Herpetofauna are intrinsically valuable.

Reptiles and Amphibians are amazing creatures that can be a source of inspiration and are worthy of admiration. We encounter them in the natural spaces that we explore and it sparks questions. How do they experience their environment with their unique senses and perspective? How do snakes find their prey and manage to swallow something larger than their own head? How does their scaly or slimy skin feel to the touch? Reptiles and amphibians fuel our curiosity.

Herpetofauna need our help.

According to the the Minnesota Department of Natural Resources herpetofauna face many factors contributing to population decline including road mortality, habitat loss and degradation, effects of climate change, spread of disease (such as Ranavirus and Chytrid fungus), increased pollution, and overuse of agricultural and backyard pesticides. By helping a turtle across a road in the direction it was traveling you may very well save its life. Often turtles on the move are seeking new wetlands with the change of seasons, traveling to a nest site to lay eggs, or are newly hatched young on the move to find a permanent body of water to call home. One factor impacting the recent decline in frogs and toads is habitat loss in fast growing urban areas. Tadpoles eat lots of algae as they are growing which helps to trap excess nutrients in wetlands. Herpetofauna in general are very good at converting their insect prey to biomass. By occupying the middle of the food chain they are often eaten by other herps, birds, fish, and mammals. These animals are incredibly helpful in the web of life.

Herpetofauna are sensitive bioindicators representative of ecosystem health.

Herpetofauna have physiology that is sensitive to a variety of environmental factors. For instance, frogs have permeable skin to help them breathe and lay their egg masses in or very near to fresh water sources. This makes these animals valuable research subjects as bioindicators of ecosystem health. Herpetofauna tend to thrive best in clean, healthy habitats with good water quality and will occur in lower population abundance and species diversity if there are environmental contaminants. Existence of particularly rare species can also indicate a valuable habitat that may be vital to other animal or plant species sensitive to disturbance (MNDNR, 2018).

Potential educational opportunities and health benefits of being outdoors.

Teaching students about herpetofauna opens opportunities for inquiry, experiential, and hands-on learning as well as humane education. By looking for wild animals students get outside and experience the multitude of benefits that being in nature can provide. Teaching in natural settings has been shown to reduce blood pressure, improve attention, and foster positive environmental attitudes. Spending time in nature can even improve mental health and emotional regulation, particularly in students with ADHD. Nature play can also help preschoolers improve their gross motor skills and ability to assess risk during play. These are only a few of the benefits of environmental education and nature play still being studied and expanded upon (Gill, 2014).

Minnesota science standards.

Herpetofauna give us opportunities to teach about the concepts of habitats, ecosystems, food webs, body parts, characteristics of living versus nonliving organisms and more. These animals can be an interesting way to incorporate ecological themes into elementary science education to meet state standards.

The following resource guide tries to bridge the gap between the classroom and nature center experience by providing engaging ecological activities, educational games, and recommended citizen science programs. It is intended for elementary educators to pick and choose the elements that they find most developmentally appropriate, interesting, or useful for building environmental education units. No matter what amount of green space or lack thereof your school may have, the games and activities are adaptable to fit your needs.

Vocabulary Terms

Herpetology: the study of reptiles and amphibians

Herpetofauna: grouping term including all reptiles and amphibians (sometimes abbreviated to “herps”)

Field herping: the act of seeking out wild herps in natural or semi-artificial spaces

Reptile: Traditionally this is a group of animals which are generally ectothermic, have scaly skin that sheds periodically, lay their eggs with leathery shells in nests on land, and young hatch from the egg appearing like smaller versions of the adult animal.

Amphibian: Traditionally this is a group of animals which are generally ectothermic, have slimy skin that sheds periodically, lay their jelly-like egg masses in freshwater, and young hatch into a tadpole or larval stage before undergoing metamorphosis into adulthood.

Species: scientific name for animals that share the same genes and are capable of breeding with one another, according to some species concept definitions.

Venomous: describes an animal which injects a toxin into its victim through fangs, stingers, spines, etc.

Poisonous: describes an animal which secretes toxins from the surface of its skin

Ecology: the study of living things, their environments, and the relationships between them

Habitat: the place that an animal lives which can provide enough food, water, air, shelter, and space

Aquatic: depends on living in or near water habitats such as ponds, lakes, rivers, or streams

Larva: This second stage in an amphibian life cycle is fully aquatic and needs to breathe with gills underwater. Depending on the species, it may undergo metamorphosis so that it can emerge onto land.

Tadpole: A larval frog or toad. This second stage in a frog or toad life cycle is fully aquatic and needs to breathe with gills underwater. Eventually it will undergo metamorphosis so that it can emerge onto land.

Mating Call: during the springtime many species of frogs and toads call to find a mate

Predator: an animal that hunts, catches, and eats other animals

Prey: an animal that is chased, caught, and eaten by other animals

Herbivore: an animal with a diet consisting of plant materials such as leaves, shoots, roots, tubers, or fruit.

Omnivore: an animal with a diet consisting of a mix of plant materials and meat from the bodies of other animals

Carnivore: an animal with a diet consisting of meat from the body of other animals which may include whole prey, muscle meat, organs, bones, etc.

Insectivore: an animal with a diet consisting primarily of insects

Scat or Feces: scientific terms for animal poop

Scales: a protective body covering made up overlapping plates of keratin

Camouflage: coloration patterns on animals that help them blend into their natural surroundings

Ectothermic: herpetofauna do not produce their own internal body heat and because of this, usually have internal body temperatures similar to their surroundings. Also referred to as “cold-blooded”.

Basking: when an animal lies in the sun to raise its body temperature

Thermoregulation: when an animal moves to a different area to change its body temperature if it gets too hot or cold

Brumation: a period of energy conservation with little to no activity over the winter (similar to what hibernation is for mammals)

Hibernacula: a place such as a rock crevice that stays humid and does not freeze below the frost line where snakes may den communally for the long, cold winter months

Ethics of Wild Animal Encounters & Field Herping Etiquette

Before you go into the field to search for wild herps I would suggest explaining these ethics briefly to your students. As a precaution you should study what species are in your area and which ones could be venomous or poisonous to avoid accidental contact. There may even be local or federal laws and regulations to consider if there are protected species in your area. Take these into consideration at least briefly to be prepared for what you may encounter out in the field.

Be respectful to the animals and environment. Try to use “leave no trace” practices while you hike and explore natural areas. Don’t leave your trash behind. Leave only footprints. Take photos of the cool things that you find along the way to save memories.

Don’t destroy habitat. If you find rotting stumps or logs, carefully turn them over rather than ripping them apart to search for animals. Place rock piles back how you found them. When replacing these cover objects do it carefully so as not to crush animals and insects that may be underneath. These spaces are humid microhabitats used by many small animals.

Don’t harm animals, even the ones you weren’t looking for. This includes insects and common herps. Stop and explain to students that they are only visitors and the animals or insects deserve to feel safe in their home. Try very carefully to not crush animals when turning back over rocks.

Don’t handle animals unnecessarily, it could mean life or death. Less contact means less stress for the animals. Observe them in their habitat if they are too difficult to catch or if it would cause the animal too much stress to be handled. Observing an animal in their habitat can often teach you more about their natural behaviors besides just escape or defensive behaviors. Try not to handle animals for too long and avoid accidental exposure to sunscreen and insect repellent on your hands or arms that are toxic to herpetofauna. If an animal doesn’t calm down after a few minutes of handling, then release them on their way. Stressed animals may regurgitate a recent meal, drop their tail (skinks and some salamanders), or urinate or defecate on you. That lost meal may have taken days to find and represents a significant energy loss to the animal. When taking photos of your finds, try to keep the animal out of direct sunlight for long periods of time or it could overheat and even die.

There are consequences of taking an animal from the wild. Depending on local, state, and federal law some animals can be collected to be kept as pets. Can you care for the animal for its entire natural lifetime? Can you provide proper prey items and nutrition for the animal? Can you provide an appropriate habitat? These are all considerations before removing an animal from the wild.

Return animals to the exact same place you found them. Remember where you collected the animal by landmarks, marking the area somehow, or taking GPS coordinates. If you take the animal to a new area to take better photos, please return it to its home territory.

Do not return animals to the wild that have been kept for more than a few days. Your animal could spread potentially deadly diseases or parasites to wild populations of herpetofauna. Additionally, the animal may not know how to take care of itself, find enough appropriate food, or defend itself when encountering another animal's territory.

Respect private property and don't disturb research. When searching for a green space to take your students, be aware of private property signs and respect those spaces by staying out. Ask before entering shared properties or sensitive natural areas. Even nature centers and state parks may have strict rules about interacting with wildlife. If you find artificial cover objects such as large pieces of plywood or sheet metal arranged in a pattern, they may be part of a research project. If you happen to lift any of the boards replace them exactly how you found them.

Take photos of the animals you find and report them to citizen science projects. You don't have to know the species to enter a photo into most databases. Give it your best guess and take note of the location where you found it. Even photos of dead and road killed animals are helpful to researchers. Mark that the animal was deceased when you submit your observation. Road mortality hot spots get attention from nongame wildlife researchers and may lead to important habitat improvement projects.

Report rare species sightings. If you happen to observe a rare species it is especially important to report your find. Contact your state Department of Natural Resources and include a location and photo if possible. When reporting rare species to citizen science projects, you may want to be careful to see if it is a closed database accessed by researchers, or if its records are accessible to the public. Rare species are often targets of poaching. It is recommended that if you post photos of rare species on social media you only include the county and state where it was found.

Educate others about what you are doing. If someone sees you and your students holding animals you have found, use this as an opportunity to teach them more about these cool critters.

*Adapted from CaliforniaHerps.com, 2018.

Recommended Best Practices for Handling Live Reptiles & Amphibians

Encountering an animal in the wild can be an exciting moment and a great opportunity for learning. However, it is important to remember safety before attempting to pick up an animal to observe it closer. Capture causes stress on wild animals and may also elicit defensive displays in many species of herpetofauna. Observing an animal in its natural habitat can also be a very valuable learning experience.

If you successfully capture an animal, then as a general rule of thumb make sure that students keep their fingers away from both the animal's face (which can bite) and their own face (because of germs). Before interacting with any live animals you should ask students to wash off any bug spray or sunscreen that might be on their hands as this can harm the animals. Be sure to have students wash their hands again after touching any animals.

Only hold animals that you are comfortable with as even seemingly docile species such as painted turtles will try to bite if they get scared. If there is any risk that an animal may get dropped, then it would be best to observe it while students are sitting or not capturing it at all. Have students sit when handling animals if this is a new experience for them. Having an adult or responsible student hold the animal and take it around the group to carefully touch is better than passing the animal to every child.

Before you head out to look for critters, study some distribution maps to determine which species are likely to live in your area and learn their habitat preferences.

Here is generally how to catch and hold different kinds of herpetofauna.

Snakes - In Minnesota you are generally safe picking up snakes without fear of venomous species. Our most common and widespread species in the state is the Common Gartersnake, easily identified by its slender body marked with three yellow stripes along the back and sides. Other common species include the Red-bellied Snake, Western Foxsnake, Gophersnake, Plains and Eastern Hog-nosed Snakes, and Common Watersnake. In total Minnesota has 17 species of native snakes. Timber Rattlesnakes (labeled as a rare species by MNDNR) are the only prevalent of the two venomous species of snakes and are present in southeastern Minnesota.

Snakes should be handled firmly, but gently and captured near the last third of their body to keep your hands safe from potential bites. Carefully pressing your hand down over the snake's body can help to pin it to the grass or other substrate through which it is moving. Calmly lift the snake up and let it move over your hands to calm down, also called "treadmilling". If the snake does not calm down after a few minutes, then it is time to let it free as additional handling will just unnecessarily stress the animal. DO NOT hold a snake by the head as this can cause injury to the snake and dramatically increases the chances that you will get bit. Anything with a mouth can bite and snakes will most often try to bite when first picked up. Luckily the most common species are also the least likely to hurt you since Gartersnake teeth are so small and the smallest snake species rarely even try to bite. I would not recommend using equipment such as a snake hook for larger or well-hidden snakes without the assistance of a trained professional to avoid accidentally injuring animals.

A few species of snakes have dramatic defensive displays when they feel threatened since we appear to them as scary, potential predators. These are snakes telling you "go away and don't eat me!" Eastern and Plains Hog-nosed Snakes either hiss loudly and strike with a closed mouth, or they pretend to "die" by writhing and flipping over on their back. Western Foxsnakes may pretend to mimic a venomous rattlesnake when threatened by coiling up, buzzing their tail, and striking with an open mouth.

Venomous Snakes - Do not handle unless you are a trained wildlife professional.

We have only two species of dangerous, venomous snakes with which you should become familiar if you live in their habitat. These are the Timber Rattlesnake which lives among the bluffs of southeastern Minnesota and the Eastern Massasauga which is a very rare species which may not exist in Minnesota anymore, but also would also reside in southeastern Minnesota.

Lizards - Minnesota has three species of lizards which run very fast and tend to be difficult to catch. I would not recommend trying to catch these animals unless you have at least 5th or 6th grade students with well-developed fine motor skills. Since these lizards are only a few inches long they are very fragile. One of their defensive mechanisms is to drop their tail which will continue to wriggle to distract predators while they run away. Be prepared for this if you are trying to catch lizards.

Turtles - If you are by a pond, lake, or river, then chances are there are turtles to be found on nice sunny days basking on logs or shoreline. Large fishing nets can make catching turtles much easier, but they can also be caught by hand. Most commonly you will encounter Painted Turtles or Snapping Turtles. Pond turtles such as Painted or any of the three Map Turtle species can be held by their shell like a hamburger with thumbs on the bottom and fingers on top or vice versa. Ideally, point the turtle so it is facing you since their defensive response is to urinate when picked up by a potential predator.

Common Snapping Turtles and Softshell Turtles (Spiny or Smooth) are a different story when it comes to handling and should only be picked up or moved by confident adults or professionals. These species have extremely long necks and can deliver painful bites.

Common Snapping Turtles can be picked up when they are smaller without injury to the animal. Hold the animal like a hamburger, but with your hands in the space between the back legs and tail. If the animal is too heavy, scratches repeatedly with its feet, or bites defensively when held this way then it will not be safe to handle it as you may accidentally drop the turtle when it snaps. Large Snapping Turtles should be left alone and observed from a safe distance. Stay back about three or more feet with students which should be ready to clear a path if the turtle decides to move. Leave the turtle an escape route via a gap in the circle if students are observing the animal. Larger Snapping Turtles that need to be moved away from a road should be carefully slid onto a piece of cardboard, tarp, or shovel by grabbing one of their back legs. Drag the turtle across the road in the direction it was originally traveling. DO NOT grab snapping turtles by their long tails as this can cause spinal injuries.

Softshell Turtles are river species which means they are powerful swimmers and should only be handled when they are small (approximately less than 8 inches across). Spiny Softshell Turtles are also a notoriously aggressive species with a rather long neck and strong beak used in the wild to crush crayfish shells. In my experience holding Softshells, they can easily feel through their leathery shells and do not seem comfortable being handled like a hamburger as with hard-shelled turtles. Smaller Softshells can be held like a pancake with one hand flat on top and one hand flat on the bottom. Be sure fingers are well away from their head to avoid getting bit.

It may be helpful to demonstrate to students how to safely help a turtle across the road should they encounter one while they are outside of school with their family. Along with these handling tips it is essential that you help a turtle move in the direction that it was originally heading. Turtles travel to other bodies of water or nest sites and will just return back to the same spot if relocated in the wrong direction.

Frogs & Toads - These amphibians are usually easy to find around ponds, lakes, or streams. It may be helpful to use a large fishing net to help capture fast-moving frogs. With some practice frogs can even be caught by hand. Toads are quite easy to pick up as these land-dwellers do not escape as quickly as frogs. Let students know that a frog or toad will likely urinate on them as a defensive behavior. Remind the students that even though amphibians are “squishy”, they need to be handled carefully to not hurt the animals. The easiest way for students to catch or hold frogs and toads is often inside of both cupped hands so as not to squash the animal. Older students can be shown by an adult how to hold frogs or toads with their thumb and first finger making an “O” shape around the animal’s waist like a belt. This allows them to see the animal better. If the animal continues to squirm to get away, it is time to let it go to prevent further stressing out the animal.

Salamanders - These amphibians are more likely found hiding under logs or leaf litter of the forest floor. They tend to like cool, moist conditions and should be handled with care. They are not very fast moving and can be picked up to walk across open hands. Some wild salamanders can secrete mild toxins from their skin when they feel threatened so they should not be handled for very long periods of time and students should not touch their faces after handling salamanders. The largest species of land salamander in Minnesota is the Eastern Tiger Salamander, which is most likely what you will find, but the tiny Blue-Spotted Salamanders are also widely distributed across the state.

Tadpoles & Larval Salamanders - These aquatic, baby amphibians should be handled very carefully or just observed in the water. Have students use small scoop nets and cups or their hands in the shape of a cup if they have appropriate fine motor skills. Tadpoles and larval salamanders need to breathe underwater so make sure that students keep them submerged in water from the animal’s habitat within in a cup or bucket. Observe them for a little while and release them back to their original spot before the water in their cup or bucket warms up too much. Baby animals are more sensitive to temperature changes than adults.

Herpetology Games

Games have a duration of less than 30 minutes and require minimal setup and supplies. The intent of games is to let students move around and have fun to illustrate a concept and then discuss and reflect on their observations after the game. Games are not meant to meet state science standards, but can be paired with activities.

*Adapted from Dodge Nature Center's curriculum template

Snake Sticks

Objectives:

Practice observation skills during a nature hike.

Simulate the benefits of camouflage.

Vocabulary Terms: Reptile, Camouflage, Predator, Prey, Basking

Group size: Any

Duration: 10-20 minutes

Materials: 5-10 sticks painted with camouflage patterns or as realistic snakes

Setup:

Hide the painted snake sticks around play area before students arrive. Sticks can be on the ground, in shrubs, or even up in tree branches as these are all places that snakes may be found in the wild.

Rules & Gameplay:

Hike through the area playing hide and seek with the hidden and camouflaged "snakes". Students count silently on their fingers when they see a "snake". Go back through afterwards to have students reveal where they saw the snake sticks.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

Snakes have many different patterns on their scales that help to camouflage them in their natural surroundings. Some snakes slither through the grass and some climb high in the trees to find their prey or escape predators. A sunny branch may also be a good place for a snake to bask.

- Which "snakes" were difficult to spot? Which ones were easy?
- Which colors or patterns made better camouflage for the "snakes"?
- Why would camouflage be helpful for the animal?
- Why might a snake need to climb up into the trees?

Camouflage Frogs

Objectives:

Practice visual observation skills.

Act out simple predator-prey interactions to simulate the benefits of camouflage.

Vocabulary Terms: Amphibian, Camouflage, Predator, Prey

Group size: 10-30 students

Duration: 10-20 minutes

Materials: One 2-inch square of paper per student & assorted crayons

Setup:

Point out the boundaries of the play area which may be a classroom, a small section of a playground, gymnasium, outdoor space, etc. Have students each take a paper square (their "frog") and spend about 2 minutes decorating it to camouflage with something in the play area. Explain the meaning of predator and prey.

Rules & Gameplay:

Split the group in half. One half of the group will leave the area so that they don't see the other half hiding their frogs. The group that leaves gets to discuss what type of predators they will be that like to eat frogs (herons, raccoons, snakes, barred owls, mink, largemouth bass). Give the first group about 2 minutes to hide their frogs and each student sits down in the middle of the play area once their frog is hidden. Frogs must be hidden in plain sight and not behind any objects. Give them a 30 second warning and a 10 second countdown to finish hiding. The second group may then come back and each student tries to find one hidden frog to "capture and eat" as if they were a predator. When they find a frog, they pick it up and go find a seat in the middle. Once all frogs are found the groups switch roles and the second group gets a chance to hide their frogs while the first group are seekers.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

Frogs and many other species of animals use camouflage patterns on their skin to help them blend into their surroundings and help them to avoid predators.

- Which hiding spots did you think were most difficult to find? Why?
- Which colors or patterns made better camouflage in your opinion?
- Why would camouflage be helpful for wild frogs?

Spring Peepers

Objectives:

Practice careful listening skills.

Act out part of a frog's life.

Vocabulary Terms: Amphibian, Mating Call

Group size: 5-20 students (if class size is larger, then split into two groups to try this activity)

Duration: 5-15 minutes

Materials: one battery-operated noise maker that beeps

Setup:

Describe the play area boundaries. This works best in a space with lots of small hiding spots such as a forest, tall grassy area, playground, or classroom. Turn the beeper box on to let students know the sound they will be listening for.

Rules & Gameplay:

Before starting explain that the students are male spring peeper frogs calling to find a female mate (the beeper box). They have to peep loudly like frogs while they are searching for the peeping female, just like a real frog chorus. Once they find the female they continue to peep, but stay standing right next to her. They may not pick up or touch the beeper box. The game ends when all of the frogs are together next to the female frog (beeper box).

To hide the beeper box the group stands away from the play area with their backs turned while the leader goes to hide the beeper box with the beeper turned off at first. Students count up to 30 while the beeper is hidden. The adult hiding the beeper turns it on just before hiding it and then leaves the hidden area while students are still counting so it stays a secret. At thirty the students start peeping loudly while trying to also listen for and find the beeper box representing the female frog.

Play additional rounds in new hiding spots.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

The males of many species of frogs and toads call to attract a female to mate with them in the springtime. Often different species call at different times of the spring so that their calls have a better chance of being heard by a member of their own species.

- Was it hard or easy to hear the female with all of the noise from the other frogs? Why?
- Did you try anything differently the second time to help hear the female frog?
- Why do you think each species of frog and toad call at different times in the spring?

Frog Call Mixup

Objectives:

Practice careful listening skills.

Act out part of a frog's life.

Vocabulary Terms: Amphibian, Mating Call

Group size: 15-30 students

Duration: 15-25 minutes

Materials: Cards labeled with 6 different frog and toad sounds with enough copies that 5 of each sound match

Setup:

Describe the play area boundaries. A flat, open space works well for this. Hand each student a card that they keep a secret and hold close to their chest. This shows which sound to make.

Rules & Gameplay:

Students walk quickly at random around the play area so that they mix up. When the adult leader calls out "Springtime!" the students start to make their sounds loudly so that everyone can hear. When they find someone else matching their sound they link arms together and keep moving around to find their other matches. After about 2 minutes the adult leader calls out "Summertime!" and the students freeze and go quiet. Ask for any unmatched frogs and toads to come stand by the adult, then go around and point to each group for them to make their sound. If their sound matches, then the lonely frog or toad goes to stand by them. In the case of a smaller game there are sometimes frogs or toads with no mate, which is okay to explain as there were no more animals of your species in the pond.

Have students hand in their cards and pass out new ones at random to play a second round.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

The males of many species of frogs and toads call to attract a female to mate with them in the springtime. Often different species call at different times of the spring so that their calls have a better chance of being heard by a member of their own species.

- Was it easy or hard to find other frogs or toads to match your sound? Why?
- What was different about the second time the game was played?
- What patterns did you see?
- How is this like frogs and toads in the wild?

Sneaky Snakes

Objectives:

Practice careful listening.

Act out roles of either a rodent or a snake.

Vocabulary Terms: Reptile, Predator, Prey

Group size: 10-20 students

Duration: 10-20 minutes

Materials: 3 blindfolds

Setup:

Describe the boundaries of the play area. If outside then ideally find a space with tall grass and some trees or shrubs. If indoors try to play in an area with some obstacles to sneak around. Try playing outside on gravel as an extra challenge for the sneaking snakes. Explain the meaning of predator and prey. In this case, the snakes are predators and the voles are prey.

Rules & Gameplay:

“Voles” are blindfolded and sit still while listening. This is pretending that the voles are busy finding and eating food such as grass seeds so they are not watching for danger, but can still listen. All other students make a line facing the voles spaced at least 20 steps back. The adult leader points to 1-5 of these “snakes” to quietly sneak closer towards the voles. The adult calls “stop” when the snakes are within 5 steps of the voles. Then the voles hold up the number of fingers for how many snakes they could hear sneaking towards them. Voles remove their blindfolds to reveal the answer. During the next round select new “voles” and “snakes” mixing up the number sneaking each round until all students have participated as listening voles and sneaking snakes.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

As predators, snakes do not have external ears to hear and their vision is restricted to their low perspective close to the ground. Primarily, they use their senses of smell and taste together to locate prey with their forked tongue. Their tongue flicks out and collects scent information which is interpreted by a specialized organ in the roof of the snake’s mouth. As prey, voles have very good hearing so that even if they do not see or smell a snake approaching, they will probably hear it first.

- As a vole what was hard about trying to count the number of snakes?
- As a snake what was hard about trying to sneak closer?
- Why might it be important for a vole to hear how many snakes are hunting it?

Sleepy Gartersnakes

Objectives:

Practice observation skills.

Roleplay an annual event in a snake's life.

Vocabulary Terms: Reptile, Camouflage, Thermoregulation, Brumation, Hibernacula

Group size: 5-20 students

Duration: 5-15 minutes

Materials: none

Setup:

Describe the boundaries of the play area. If outside, then ideally find a space with lots of hiding spaces such as a section of forest or a playground. If indoors, try to play in an area with obstacles to hide behind.

Rules & Gameplay:

This is just like the classic game of "sardines" where one child hides and everyone else seeks. Choose the first child to hide. They are the first "gartersnake". All other children turn around and cover their eyes while counting to thirty aloud and the gartersnake hides. Once they are done counting, they turn around and try to find the gartersnake. If they find the hiding gartersnake, they quietly hide right next to them and now they are also a gartersnake. Once every child has found and hidden with the gartersnakes, the game can start over with a new gartersnake to hide first.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

Wild gartersnakes may hide in cool, humid rock crevices to help them thermoregulate during the day or for brumation during the long, cold winter months. Communal hibernacula like this are used year after year by sometimes multiple species of snakes to go into a deep sleep for the winter months (brumation). Gartersnakes are also some of the very first snakes to wake up in the springtime and can often be seen on the first few warm days.

- What places were hard to find with the gartersnake hiding?
- Was this easy or hard? Why?
- Why might gartersnakes hide like this together in the wild?

Herpetology Activities

Activities have a duration of about 30-45 minutes and require a little more materials and setup time than games. These go more in-depth to roleplay ecological concepts and address state science standards.

*Adapted from Dodge Nature Center's curriculum template

Scent Challenge

Objectives:

Act out the challenge of an animal that relies on its sense of smell to solve problems. Work as a small team to agree on each answer.

MN Science Standards Benchmarks:

0.1.1.2.1 Use observations to develop an accurate description of a natural phenomenon and compare one's observations and descriptions with those of others.

5.1.1.1.1 Explain why evidence, clear communication, accurate record keeping, replication by others, and openness to scrutiny are essential parts of doing science.

Vocabulary Terms: Reptile, Predator, Prey

Group size: 10-30 students

Duration: 20-40 minutes

Materials: 4 different essential oils or other strong smelling scented items, sets of film canisters or small bottles to be filled with scents, permanent marker to label containers with either a letter or number, answer sheets, small pencils

Setup:

Select 4 distinct smells to use. Make one master bottle of each scent labeling them A, B, C, and D. Make 4 additional bottles of each smell labeling these in a random order with the numbers 1 through 16. Be sure to keep track on a master answer sheet which numbers match A, B, C, and D. At four different stations around the room place one of the master bottles and one of each scent labeled with a number.

Rules & Gameplay:

- Split students into 4 teams and have them elect a team recorder. Give each team recorder one sheet of paper and a small pencil to write down answers. It may be easiest to write out a quick answer sheet so the team can just circle their answer.
- Each team may choose which type of reptile they are that relies on its sense of smell/taste to experience the world and write this on their answer sheet.
- Send each team to a station and give them about 1-3 minutes to decide as a team which numbered scent at that table matches their master scent.

- Flicker the classroom lights or clap if you are outside to get students attention to listen for the next step. Show them how to close all the scent jars at their station and rotate clockwise around the room to the next station.
- Repeat until every team has visited all four master scents.
- Have student return to their seats or sit in the middle of the area if outside after finishing their last rotation to show that they are done. Go over the answers as a group and discuss.
- For an extra challenge you can make additional sets of scents.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

Snakes and many lizards navigate their world using their keen sense of combined tasting and smelling. When their tongues flick out they collect scent particles on their tongue which are interpreted by a specialized organ in the roof of the animal's mouth. These smells can tell them about what other animals were nearby recently which could include potential prey to eat or predators to avoid.

- What was hard or easy about this challenge? Why?
- How did your team act like the animal's brain cells telling it what it was smelling?
- Why could these smells be important for the animal?

Predator & Prey

Objectives:

Roleplay predator-prey interactions.

Observe the challenges that each animal faces to survive.

MN Science Standards Benchmarks:

3.1.1.2.4 Construct reasonable explanations based on evidence collected from observations or experiments.

5.4.4.1.1 Give examples of beneficial and harmful [human] interaction with natural systems.

Vocabulary Terms: Predator, Prey, Food Chain

Group size: 20-30 students

Duration: 20 minutes for first round, 10 minutes for second round, 10 minute discussion

Materials: 30 sets of a matching clothespin and piece of paper with numbers 1-30 representing voles (clothespins) & their homes (paper), 30 blue popsicle sticks, 30 green popsicles sticks, 10 yellow popsicle sticks, 5 red popsicle sticks, randomly choose 5 of the colored sticks to paint black on one end, 4 labeled predator clothespins (gartersnake, foxsnake, owl, fox), timer to signal end of each round

Setup:

Define the play area boundaries in ideally a flat, open space such as a lawn or gymnasium with a few obstacles set up to hinder movement. Distribute a set of vole/home markers to each player. Have players wear their clothespin to remember their number and spread out on the play area and set their “home” paper somewhere. Assign roles randomly for the 4 predators by swapping out their vole/home markers with one representing their role as a predator. Predators have no paper to indicate a permanent home.

Rules & Gameplay:

- Players freeze where they are at their “home” stick. Instructor goes around somewhat randomly tossing the colored food sticks on the ground across the entire playing area. Some areas may have good foraging and others may be sparse just like in a real habitat.
- Set a timer for 30 seconds. When the instructor says “GO” the voles may walk (no running) to pick up food sticks one at a time and take them back to their “home”. Meanwhile predators are moving around as well, but cannot interact yet. Instructor calls “STOP” when the timer sounds.
- Voles get 5 steps to try and make it back to their homes safely. Count out loud to 5 slowly as voles slowly make their last steps. Now it is the predators turns. A vole that gets caught gives up its food sticks to the predator and is now a new vole (voles reproduce really fast). A predator that is caught by another predator gives up its food sticks and is out of the game.

- The Gartersnake goes first and is allowed 5 steps to capture and eat (by tagging) one vole that is out in the open or in its home. They could choose to instead pick up any yellow or red food sticks from the ground within their movement. These represent high quality food items such as insects. *This is the first time that food stick colors are revealed to have a nutritional value adding up to points.*
- The Foxsnake goes next and is allowed 10 steps to capture and eat up to 2 voles that they can reach in their movement that are out in the open or in their homes. The Foxsnake cannot pick up food sticks from the ground since insects are not in their natural diet.
- The Owl goes next and is allowed 10 steps to capture and eat any voles that it can reach outside their homes during their movement or may capture the Gartersnake or Foxsnake. The Owl cannot pick up food sticks from the ground and cannot capture voles or snakes inside of vole homes.
- The Fox goes next and is allowed 12 steps to capture and eat any voles that it can reach outside their homes during their movement or may capture the Gartersnake, Foxsnake, or Owl. The fox cannot capture any voles or snakes inside of vole homes.
- Start round 2. Set the timer for 30 seconds and call "GO". Voles walk to gather food sticks one at a time to take back to their homes. Predators move around, but do not interact yet. Instructor calls out "STOP". Voles get 5 steps to try and make it back to their homes safely. Count out loud to 5 slowly as voles slowly make their last steps. Repeat predator action steps in order.
- Time to tally up points. Popsicle sticks represent food with many "cheap" food items and progressively fewer "quality" food items with point values assigned to each of the colors (blue = 1, green = 2, yellow = 5, red = 10). Each player adds up their points depending on the colors of sticks they hold in their hand.
- Determine survival. Animals that do not survive sit down. Voles and the Gartersnake need at least 4 points to survive. The Foxsnake needs 5 points, Owl needs 7 points, and Fox needs 8 points.
- Announce disease sticks. Any animals holding at least one of the black-tipped sticks has died. Use examples such as ingesting prey exposed to agricultural pesticides, snake fungal disease (Snakes), avian flu (Owl), or mange (Fox).

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

- What did you observe about the life of a vole? Was it easy or hard? Why?
- In terms of a food chain why did the predators need to gather more food points?
- Why would the predators have a hard time capturing enough food? What could we change in our food chain to help them survive more easily?
- What would happen to the voles if humans removed all of the predators in their food chain?

Wildlife Sleepover

Objectives:

Observe animal behavior up close.

Observe animal movement and compare body parts.

Build a habitat to fulfill the needs of a living animal.

MN Science Standards Benchmarks:

0.4.1.1.2 Identify the external parts of a variety of plants and animals including humans.

1.1.1.1.1 When asked "How do you know?", students support their answer with observations.

1.4.1.1.1 Describe and sort animals into groups in many ways, according to their physical characteristics and behaviors.

1.4.2.1.1 Recognize that animals need space, water, food, shelter, and air.

1.4.2.1.2 Describe ways in which an animal's habitat provides for its basic needs.

3.1.1.2.1 Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one's own observations or investigations.

3.1.1.2.3 Maintain a record of observations, procedures and observations, being careful to distinguish between actual observations and ideas about what was observed.

5.4.2.1.1 Describe a natural system in Minnesota, such as a wetland, prairie, or garden, in terms of the relationships among its living and nonliving parts, as well as inputs and outputs.

Vocabulary Terms: Reptile, Amphibian, Ectotherm/Cold-blooded, Habitat, Scat/Feces

Group size: 10-30 students

Duration: approximately 45 minutes to find an animal and make the lists

1-2 days total with the animal released in the exact same location

Materials:

- 10-gallon or 20-gallon glass aquarium with a secure screen lid **OR** clear plastic tote with a locking lid and many holes drilled along top sides and lid for air flow
- paper towels for land-dwelling animals
- water dish for land-dwelling animals that is big enough for the animal to sit inside
- cardboard box, paper towel tubes, cleaned rocks or bark pieces for hiding spots
- tap water left out for 48-hours to evaporate chlorine

Setup:

Decide on educational goals of the wildlife sleepover. What do your students hope to observe? Set up the habitat:

- Clean out the aquarium with a 2% chlorhexidine solution (available online or at most farm supply stores) and rinse thoroughly with water before and after any animal uses the space. This will kill off any bacteria or other contaminants. If you choose to use any bark or rocks from outside for hiding places then spray those in the solution and rinse thoroughly, allowing them to air dry.
- Place the aquarium in a safe place in the classroom where it will not get bumped and so that it is out of direct sunlight which could overheat your critter.

- For land-dwelling animals, line the bottom of the tank with paper towels. This provides a relatively sterile substrate and allows you to observe interesting feces/scat. For amphibians, moisten the towels with about a quarter inch of your dechlorinated water. For reptiles, keep towels dry. For small aquatic turtles, do not line with paper towels but fill the aquarium with as much dechlorinated water as twice the height of the animal so it can easily put its head up to breathe.
- For land-dwelling animals, fill the water bowl and provide at least two hiding spots for the animal. For aquatic turtles, provide a small pile of rocks for the turtle to climb out of the water.
- Ready for your wildlife sleepover!

Rules & Instructions:

Explore around your chosen green space or school yard to see what kinds of critters you can find. Easier species to keep for a wildlife sleepover include common species of frogs, toads, small snakes, large salamanders, and small aquatic turtles. Be sure to check local, state, and federal regulations about what species are allowed. Field herping ethics and animal handling suggestions are listed in the early sections of this resource guide on pages 2-8. After initial capture and handling try to keep handling to a minimum to reduce unnecessary stress on the animal.

Allow students to research your animal to better understand its habitat requirements, preferred diet, and other interesting life history facts. Develop a list of questions about the animal and have students investigate answers to their questions in small groups.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

As a group make 3 lists in front of the class. One list is of students' prior knowledge about the animal. One list is of questions that they have come up with about the animal. One list is of observations that they have made about the animal while it was outside or in the classroom. Determine if any of the observations are answers to any of the questions. Mark questions that still need answers. Split into small groups and show students resources to find the answers they seek.

- What kinds of things does this animal need to survive?
- What does its habitat look like in the wild?
- What does this animal eat in the wild and how does it find that food?
- What do its behaviors look like and what do they mean?
- What colors or patterns do we see on the animal? How might those colors or patterns help them in the wild?

Handling Herpetofauna

Objectives:

Compare at least two species of herpetofauna.

Record characteristics that describe each species.

MN Science Standards Benchmarks:

0.4.1.1.2 Identify the external parts of a variety of plants and animals including humans.

1.1.1.1.1 When asked “How do you know?”, students support their answer with observations.

1.1.1.1.2 Recognize that describing things as accurately as possible is important in science because it enables people to compare their observations with those of others.

1.4.1.1.1 Describe and sort animals into groups in many ways, according to their physical characteristics and behaviors.

3.1.1.1.1 Provide evidence to support claims, other than saying “Everyone knows that,” or “I just know,” and question such reasons when given by others.

3.1.1.2.1 Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one’s own observations or investigations.

3.1.1.2.3 Maintain a record of observations, procedures and observations, being careful to distinguish between actual observations and ideas about what was observed.

Vocabulary terms: Reptiles, Amphibians, Cold-blooded/Ectotherm

Group size: 10-20 students

Duration: 20-45 minutes

Materials: 2-5 live animals of differing herpetofauna species or families

Setup:

Contact an organization that provides live animal programs, ideally one that allows students to be hands-on. Alternatively, if you can find enough different wild animals outside this could be done with those animals instead as long as they are released to the same place after the activity. Ask students to sit in a circle. Keep animals in containers to take out one at a time. Explain the rules for how we should touch the animals to be respectful and keep our bodies still and calm so that animals feel safe. Remind students that we do not touch the animals on their heads and show them where it is okay to touch the animals. If students are calm enough, allow them the opportunity to hold the animals, but only if it is okay with the presenter/interpreter.

Rules & Instructions:

Have the instructor bring around the animals one at a time for students to carefully touch or hold. Have each student share an observation or a question they have with the whole group either during or after they have seen the animal up close. Move onto the next animal and share new observations or questions.

Make lists back in the classroom to compare and contrast characteristics of the different animals.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

- Which animals seemed like they were amphibians? Reptiles? What evidence do you have to support your answer?
- What patterns or colors did you see on the animals? Why would those colors be helpful to survival in the wild?
- What do your students already know about the animal? What would they like to know more about?

“What do I eat?” Field Guide Practice

Objectives:

Learn about the diets of many species of herpetofauna.

Practice using field guides to find information on individual species.

MN Science Standards Benchmarks:

3.1.1.2.1 Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one’s own observations or investigations.

3.1.1.2.3 Maintain a record of observations, procedures and observations, being careful to distinguish between actual observations and ideas about what was observed.

5.1.1.1.1 Explain why evidence, clear communication, accurate record keeping, replication by others, and openness to scrutiny are essential parts of doing science.

Vocabulary Terms: Carnivore, Insectivore, Omnivore, Herbivore

Group size: 10-30 students

Duration: 30-45 minutes

Materials: field guides with local herpetofauna species or a computer/tablet with your state’s Department of Natural Resources website for local wildlife, 12 printed picture cards of various local reptiles and amphibians, optional exotic herpetofauna cards

Setup:

Print out color pictures of local reptiles and amphibians and cut them out so there is no white border. Number the pictures clearly. Include names of each species on the cards or leave this out for an extra identification challenge. Print question sheets for students to write the name of the animal that matches each number and circle the animal’s diet which should be listed as carnivore, insectivore, omnivore, or herbivore. Identify each animal’s natural diet to write your answer key. Hide the numbered animal cards around the room or an outside area before students arrive. After introducing the activity show students how to successfully look up an animal’s diet with your research materials.

Rules & Instructions:

Describe the play area. Split the students into small teams of 2 or 3. Give each team a question sheet, pencil, and field guide. If there are not enough field guides to share, then make a designated “research station” where teams can share the books to find the answers or use the DNR website at a computer or tablet. Give teams about 20 minutes to complete their hidden picture search and diet research. Ask them to try and keep the locations of the picture cards secret by taking a quick peek and then moving away.

Have teams that finish early sit down to show that they are done. After 20 minutes have all students sit together and share their answers one species at a time. If there are multiple answers for a species, then have one student use the research materials to look up and describe the animal’s diet. Have the class come to an agreement on their answer before you share the correct answer.

Discussion: Engage students in a guided discussion to share and summarize what they learned and what they were supposed to learn from your intended objectives.

- What is a carnivore? Insectivore? Omnivore? Herbivore?
- Have one student from each group demonstrate their knowledge by looking up an animal in the field guide or using the website.

Citizen Science Opportunities in Herpetology

Citizen science is crowdsourcing data collection for research projects. It can be a great tool for involving older elementary students in social action. Typically, databases ask for at least a photo of the animal and where you found it. Once the data is verified it may be used in local, national, or even global research projects. These are recommended databases and projects to get involved in citizen science.

Local Citizen Science Projects

Amphibian & Reptile Survey of Minnesota

<http://mnherps.com/>

Minnesota Turtle Crossing Tally Count

<http://www.herpmapper.org/content/pdf/mn-turtles-and-roads-project.pdf>

Minnesota Frog & Toad Calling Survey

https://www.dnr.state.mn.us/volunteering/frogtoad_survey/index.html

*Please note that this project has ended, but the website contains helpful resources on how to find and listen for frogs and toads calling in Minnesota.

National or Global Citizen Science Projects and Resources

Herpmapper

<http://www.herpmapper.org>

iNaturalist

<http://www.iNaturalist.org>

Frog Watch USA

<http://frogwatch.fieldscope.org/>

Wisconsin DNR Turtle Conservation Program

<http://wiatri.net/inventory/Wlturtles/>

University of Minnesota Extension: Citizen Science

<http://www.extension.umn.edu/environment/citizen-science/>

Scistarter - A National Science Foundation Citizen Science Project Directory

<https://scistarter.com/>

Live Animal Presentations & Public Outreach Programs

This list is only a few of the places that can offer live animal programs around the Twin Cities metro area of Minnesota. If your school is not located near the metro, then search for a herpetological society or nature center near you that can offer live animal programs.

Minnesota Herpetological Society

<https://mnherpsoc.org>

*Contact for free volunteer-based hands-on public outreach programs

Minnesota Department of Natural Resources

<https://www.dnr.state.mn.us>

*Contact your local state parks for public outreach programs

Minnesota Master Naturalists

<https://www.minnesotamasternaturalist.org>

Snake Discovery

<http://www.snakediscovery.com>

*Contact for fee-based public and private outreach programs

Dodge Nature Center

<http://dodgenaturecenter.org>

Lowry Nature Center

<https://www.threeriversparks.org/location/lowry-nature-center>

Richardson Nature Center

<https://www.threeriversparks.org/location/richardson-nature-center>

Eastman Nature Center

<https://www.threeriversparks.org/location/eastman-nature-center>

Carpenter Nature Center

<https://carpenternaturecenter.org>

Tamarack Nature Center

<https://www.ramseycounty.us/residents/parks-recreation/tamarack-nature-center>

Recommended for Further Research or Curriculum Development

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Adapted Materials

“Snake Sticks” adapted from Minnesota Naturalists Association training materials “Let’s Play a Game!”

“Camouflage Frogs” adapted from Minnesota Naturalists Association training materials “Let’s Play a Game!”

“Spring Peepers” adapted from Dodge Nature Center’s curriculum for “Sounds of Nature”

“Frog Call Mixup” adapted from Dodge Nature Center’s curriculum for “Sounds of Nature”

“Sneaky Snakes” adapted from Dodge Nature Center’s curriculum for “Sounds of Nature”

“Scent Challenge” adapted from personal notes on Minnesota Naturalists Association Workshop: Let’s Play a Game!

“Predator & Prey” adapted from personal notes on Dodge Nature Center’s game “Predator/Prey”

“Wildlife Sleepover” adapted from Minnesota Herpetological Society Quarantine Suggestions

“Handling Herpetofauna” blended adaptation from Minnesota Herpetological Society Hands-On Policy and best practices at Dodge Nature Center

“What Do I Eat?” adapted from Dodge Nature Center’s curriculum for “Mammals”

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