New Jersey School of Conservation
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Herpetology

After a brief discussion of the similarities and differences between reptiles and amphibians, students will search ponds, streams, vernal pools, and the forest for herpetile specimens. The session concludes with a focus on the ecological importance of these fascinating and delicate creatures.

OBJECTIVES:

1. Students will observe and explore the fragile habitats of herpetiles.
2. Students will collect, observe, identify, and release herpetile specimens.
3. Students will show their appreciation of reptiles and amphibians by explaining their value in the ecosystem.

MATERIALS NEEDED:

Dip nets; Petri dishes; magnifying boxes; field guide to reptiles and amphibians; small plastic terrarium with lid; paper towels; turtle shells; X-rays of frog and snake; turtle; corn snake.

PROCEDURE:

1. Define herpetology (the study of amphibians and reptiles from the Greek word *Herpeton*, meaning “crawling things). Use the laminated guide sheet to review the types of amphibians and reptiles as well as their similarities and differences. List these on the board.

2. Discuss the term “vertebrate.” Ask students to name vertebrates found in local woodlands. Which do they think is the most common? Inform students that in the northeastern temperate deciduous forest, salamanders make up the greatest vertebrate biomass. This means that if all the salamanders in a measured area of forest were weighed, they would outweigh any other vertebrate—even ones much larger! What are the implications of this fact on the forest food web?

3. Discuss the different types of herptiles we might find. Address any concerns or fears students might have before going outside. This is a good opportunity to show the corn snake and turtle. We do not force anyone to touch or handle the animals. However, it is a good for the students to get comfortable and ask questions about any concerns they might have.

4. Distribute dip nets to pairs of students. Hike to an area where reptiles and amphibians are likely to be found in that particular season and climate. Discuss and demonstrate proper collecting techniques. In the forest, students should roll logs and rocks away from their bodies to provide a barrier between them and what lies beneath. Each rock and log

should be replaced to its exact position to preserve microclimates. Amphibians have porous, sensitive skin, so specimens should be handled very little and placed into terrariums with water or into petri dishes with moist paper towels. Material from dipnets should be dumped back into the water and not onto the shore.

5. Establish a central location where specimens can be brought for temporary holding. Allow students 15-20 minutes to collect specimens. Discourage students from collecting multiples of the same specimen and oversee all egg collection carefully.

6. Collect the nets and gather students in a central area to discuss what herpetiles have been found. Use the attached information sheet for facts on individual species.

7. Have students carefully release each specimen near where it was found.

SUMMARY:

Ask students why it is important to study herpetiles. One reason is their importance in the food chain, e.g. snakes help to control rodent populations and amphibians help regulate insect populations. Point out that amphibians and some reptiles provide a link between aquatic and terrestrial food chains. Another important reason for studying amphibians is to keep track of the fragile habitats they require for breeding, including vernal pools and several types of wetlands. These habitats provide services to humans as well including flood control and water filtration. Thirdly, refer again to the porous skin of most amphibians. The vulnerability of amphibians to water and air pollution, as well as to ultraviolet radiation make these species excellent indicators of environmental degradation.

Give examples of how NJSOC does research on certain amphibian species to determine the health and quality of our environment. In making these observations we can determine if there is something wrong with our environment and therefore, something wrong with us.

BIBLIOGRAPHY:

Behler, John L. *National Audubon Society Field Guide to North American Reptiles and Amphibians.* New York: Alfred A. Knopf, 1996.
Conant, R. & Collins, J. *Peterson Field Guides: Reptiles and Amphibians.* Boston: Houghton, Mifflin & Company, 1998.
Schwartz, Vicki & Golden, David M. *Field Guide to Reptiles and Amphibians of New Jersey.* Vineland, NJ: New Jersey Division of Fish and Wildlife, 2002.
Tyning, Thomas F. *Stokes Nature Guides: A guide to Amphibians and Reptiles.* Boston: Little, Brown, and Company, 1990.

NJ Student Learning Standards

This field lesson touches upon the following NJ Science Performance Expectations and can be tailored to focus on any of the following standards

MS-LS2: Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS1: From Molecules to Organisms: Structures and Processes

- MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

- MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Climate Change

- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Connections to NJSLS – Mathematics

- MP-4 Model with mathematics.

- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems.

- 6.SP.B.5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Comprehensive Health and Physical Education

- 2.1.8.PGD.4 Analyze the relationship between healthy behaviors and personal health.

- 2.2.8.MSC.7 Effectively manage emotions during physical activity (e.g., anger, frustration, excitement) in a safe manner to self and others.
- 2.3.8.PS.1 Assess the degree of risk in a variety of situations, and identify strategies needed to reduce deliberate and non-deliberate injuries to self and others

Scientific and Engineering Practices

This field lesson (along with the additional / alternate activity) has students directly involved with

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Developing and Using Models
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

- Using Mathematics and Computational Thinking
- Obtaining, Evaluating, and Communicating Information

Social and Emotional Learning

All of our field lessons integrate the concepts of self-awareness, self-management, social awareness, responsible decision-making, and relationship skills found in the New Jersey's Core Social and Emotional Learning (SEL) Competencies.

Additional Information for Herpetology

Natural History of Common Herps of SOC

Eastern or Red-spotted Newt *Notophthalmus viridescens viridescens*

Newts are among the most aquatic of salamanders. Newts tend to have rougher skin than salamanders especially in their terrestrial stage. **Eggs** of the Red-spotted Newt are deposited singly and attached to underwater vegetation; each female lays 300-400 eggs. The fertilized egg is brown on top and yellowish underneath. **Larva** are about a half inch long and yellowish green, with a grayish stripe on each side of the body. They have soft, branched, external gills. **Juveniles** are called red efts, and live on land for 1-3 years; sometimes this terrestrial phase is omitted. They have brilliant, orange skin with deep, black-bordered red spots. **Adults** are olive to dark green above and yellowish below, usually with small, red, black-bordered spots. Most adults are aquatic though some can be found under moist logs near streams. Adult **males** can be identified by a wide tail fin and dark growths on the inside of the hind legs and toes, as well as by an overall darker color. **Females** have a smaller tail fin, are lighter in color, and in the breeding season are quite plump due to carrying eggs. Newts eat worms, insects, small crustaceans and molluscs, amphibian eggs, and larvae. Newts secrete toxic substances through the skin and thus are not heavily preyed upon, except by leeches, which can penetrate through the skin to the body cavity. Red efts are more toxic than adults.

Red-backed Salamander *Plethodon cinereus*

Red-backed Salamanders belong to the largest family of salamanders, the lungless salamanders (family plethodontidae). Lungless salamanders breathe entirely through thin, moist skin and through the moist lining of the mouth. Most (but not all) are completely terrestrial, including the Red-backed. **Eggs** of this species are suspended in a small, grapelike cluster from the roof of a cavity beneath a stone or log. The female often coils around the eggs until they hatch in about two months. The **larval** stage takes place within the egg. **Juveniles** look like miniature adults. **Adults** may be either red-backed or lead-backed (gray to black). **Male** redbacks are usually smaller than **females** and have a lighter colored cloaca.
Redbacks eat a variety of invertebrates. In defense of predators such as shrews, snakes, screech owls, and songbirds, Red-backed salamanders can detach most of their tail, leaving it to wiggle in a predator's mouth while the salamander flees. The redback can then regenerate a nearly complete new tail.

Northern Dusky Salamander *Desmognathus fuscus fuscus*

The different species of dusky salamanders are very hard to distinguish, however the Northern Dusky Salamander may be the only Dusky salamander found in Stokes State Forest. Northern Dusky Salamanders are also lungless salamanders. Although adults are terrestrial, they seldom wander far from running water. **Eggs** are laid in a grapelike cluster of 1-3 dozen beneath rocks, in rotting logs, and stream-bank cavities. The female rarely leaves the eggs even when disturbed repeatedly. **Larvae** spend the first few days after hatching on land, where they cluster on the female's back to prevent drying out. They then go to shallow running water where they live for one year. The Dusky Salamander eats insects and their larvae, spiders, sow bugs, centipedes and earthworms.

Northern Slimy Salamander *Plethodon glutinosus*

The Slimy Salamanders consist of a complex of 13 genetically distinct species which are virtually indistinguishable in the field. Stokes is home for one member of the complex: the Northern Slimy Salamander. This medium-sized salamander is black with silvery white spots. The Slimy Salamander,

like the Red-backed, is a lungless, terrestrial salamander. Every other year, females in northern latitudes lay 6-36 **eggs** beneath a rotting log. There is no aquatic larval stage. When disturbed, the Slimy Salamander's skin glands release a sticky, glue-like substance which can be difficult to rub off.

Spotted Salamander *Ambystoma maculatum*

This large, handsome, black salamander with bright yellow spots is very secretive and is typically only seen in early spring when adults migrate into vernal, fishless ponds to mate. Although **adult** spotted salamanders spend most of

their time under leaf litter or in burrows underground, and are thus difficult to observe, their eggs and larva are often found. Masses of 250 **eggs** are deposited in tightly bound, clear, or white cluster about the size of a tennis ball. Egg-laying occurs after an elaborate courtship dance which takes place on the first warm, rainy series of nights in spring. **Larva** are dark on top and whitish below wth feathery gills that sweep up and back from the base of the head; they grow to two inches.

Wood Frog *Rana sylvatica*

The **adult** Wood Frog is easily identifiable by its duck-like quacking (males only) and its dark, raccoon- like mask. It is the first frog to lay eggs in spring—often before ice has melted on breeding pools—and is the only frog found north of the Arctic Circle. Each female lays up to a thousand **eggs** in a rounded mass about the size of a tennis ball. Wood frogs lay eggs in vernal pools not inhabited by fish. Mating of a local population occurs usually within one or two days, after which adults retreat to the forest. When fresh, the eggs are clear, but usually become embedded with green algae within a few weeks. **Tadpoles** are olive or brown with a pinkish, iridescent belly and grow up to two inches long.
They are avoided by predators because of toxins in their skin. Tadpoles develop in about two months. Adult **males** are usually darker than females. During the breeding season, males develop a pad on their thumbs to help grip the female. Also, the edge of the webbing between the male's hind toes is convex; on the **female's** toes it is concave. Adult Wood Frogs—which are terrestrial—overwinter on land under rocks and logs. Wood Frogs have special antifreeze compounds in their bodies that allow them to survive periods of freezing and thawing. Adults live 3 years or more.

Spring Peeper *Pseudacris crucifer crucifer*

Spring Peepers belong to the family Hylidae. Most of the frogs in this family are distinguishable by toe pads that are used to climb trees, shrubs, and grasses. They are usually the second spring breeder in the north after Wood Frogs. Each female Spring Peeper lays up to 800 very small **eggs.** Eggs are brown on top and light beneath and are deposited on underwater plants. **Tapoles** are tiny, dark tan on top, and metallic bronze beneath. Larval Peepers leave their breeding pools before their tails have completely reabsorbed, finishing their development on the pond's edges. **Adults** can be distinguished by their high-pitched, chirping call (males), and a faint **X** shape on their back, as well as by the near lack of webbing on their hind feet. **Males** are usually smaller than **females** and have darker throats. An interesting behavior involves satellite males. These males do not defend their own territory, like other male spring peepers. Instead, they sit silently in the territory of a relatively close calling male. When a female approaches they either intercept her and mate or wait until the calling male is done mating and leaves the territory; they then resume calling in that male's territory. Adults spend their time searching for insects in trees and shrubs, rarely more than a few feet off the ground, and overwinter in leaf-litter on the forest floor. Spring Peepers actually freeze and thaw repeatedly throughout winter, using glucose to limit dehydration and protect cells from damage. Peepers come to vernal pools, wet meadows, lakes and bogs in the spring for breeding only.

Green Frog *Rana clamitans melanota*

Adult male Green Frogs have a call that sounds like a plucked banjo string. Large green frogs can be distinguished from small bullfrogs by two raised ridges of skin that begin just above their ears and run on either side of the body almost to the tail, called dorsolateral ridges. **Males** generally have eardrums larger than their eyes, and yellow throats. On **females** the eardrum is the same size or smaller than the eye and the throat is white. In the breeding season, males exhibit enlarged thumbs with dark growths. A single female lays 3000-5000 tiny, black **eggs** embedded in a filmy mass that at first floats on the surface of the water. Masses are usually about a foot in diameter and anchored by underwater vegetation. The breeding season is long and females often return to breed again and lay a second clutch. **Tadpoles** can grow to 3 and 1/2 inches in length. They are olive green above with many small,

blackish spots. Beneath, they are cream colored with a coppery hue. Tadpoles sometimes overwinter in the larval stage for up to 22 months. Green frogs are aquatic, and are more likely to be found in small brooks and streams than in large ponds or lakes, which bullfrogs prefer. However, they can be found on the margins of large lakes and in temporary woodland pools. Satellite males, unable to acquire and defend territories of their own, often borrow the territories of larger males once these males have mated and left. Green frogs overwinter in the mud at the bottom of ponds, lakes, rivers, and streams.

Pickerel Frog *Rana palustris*

The Pickerel frog is sometimes confused with the Leopard Frog. **Adult** Pickerel frogs, however, have *squarish* spots in two *parallel rows* down the back. Pickerel frogs also have a bright yellow or orange mark on the concealed surfaces of the hind legs. This mark signals to predators that the Pickerel frog's skin contains distasteful toxins. **This skin secretion will actually kill other frogs kept in the same collecting container or terrarium!** The Pickerel frog's call sounds like a low-pitched snore. Pickerel frogs usually inhabit cool, clear water such as rocky ravines and meadow streams but can be found in a wide variety of habitats. They often venture well out into grassy fields or weedy areas.

Southern Leopard Frog *Rana utricularia*

This is the traditional biology lab frog. **Adults** have irregular, roundish, dark spots on their bodies. The vocalization of the **males** is sometimes difficult to distinguish. It has been described as a two or three second snoring sound followed by a series of clucking notes. Males are generally smaller than **females**, and have swollen thumbs during the breeding season. **Eggs** are laid in oblong masses about six inches long and two inches wide. Masses consist of about 5000-6000 eggs. **Tadpoles** grow to three inches. They are olive or tan on top and creamy white below. Adults overwinter on stream bottoms. In summer, Leopard Frogs may dig burrows in stream banks and back into them to sit facing out.

Northern Gray Treefrog *Hyla versicolor*

The **eggs** of gray treefrogs are gray above and white below. They are difficult to find because they hatch in just two to five days. **Tadpoles** grow to two and a half inches. Their bodies are olive green and their tails are red, which is believed to help make indistinguishable the sillouette of the tadpole in the eyes of predators. The red tail may also signal to predators that the Gray Tree Frog tadpole has some toxic skin secretions. **Adults** have large toe pads which make them excellent climbers, and are surprisingly dry and warty. **Males** have gray or black throats, while **females'** throats are light or white. Adults do not call until late spring, when nighttime temperatures reach about 50 degrees Farenheit. The male vocalization is a loud, prolonged, eerie trill. The resting posture of the Gray Tree Frog is intriguing. The frog clenches its front feet into fists and curls them beneath its chin. The whole body is drawn together in a compact mass and the edges of the skin tightly press against the surface on which it is resting. Quite possibly, this posture results in the frog casting little or no shadow and thus makes it less visible to foraging birds, snakes, or tree-climbing mammals.

Northern Water Snake *Nerodia sipedon sipedon*

The Northern Water Snake is normally found in freshwater ponds, rivers, lakes, reservoirs, and marshes, where it is surprisingly common. It is the only snake in Stokes State Forest that readily takes to the water. Their coloration is highly variable, making them difficult to identify, but when the day is warm they can be seen sunning on stone walls, beaver lodges, overhanging branches, or in the shallow areas of the water. From mid-August to late September, each female gives birth to between twelve and sixty **live young**. Water snakes have been observed herding small fish or tadpoles with their bodies to the edges of a bank in order to concentrate them into a smaller area. Water snakes eat primarily frogs, small fish, and salamanders, but also prey on reptiles, mammals and birds. Watersnakes themselves are preyed upon by herons, egrets, hawks, raccoons, skunks, foxes, gulls, snapping turtles, and large frogs. Adults normally overwinter in the mud at pond bottoms or inside the lodges of beaver or muskrats, however, some migrate uphill to overwinter in rocky outcrops.

Eastern Garter Snake *Thamnophis sirtalis sirtalis*

Garter snakes can be black, tan, greenish, or red with usually three but sometimes two yellow stripes running down the back. The tongue of a Garter snake is red with a black tip. **Young** are born alive in a transparent sac which they must work their way out of. The courtship behavior of the Garter snake includes "mating balls" where a single female is at the center of a writhing mass of as many as a hundred males, from which she will choose one male to mate with. Garter snakes eat earthworms, various insects, frogs, salamanders, birds, and small mammals. Laboratory experiments have shown that earthworms produce a chemical substance in their skin that is easily detected by garter snakes. When caught, garter snakes release a foul-smelling fluid in defense. Although they have no fangs, they sometimes bite.

Painted Turtle *Chrysemys picta picta*

Female painted turtles are much larger than males, have shorter claws, and a cloaca close to the base of their tail. **Males** have long front claws, and long, thick tails with cloaca relatively close to the tail's tip. Two to twenty white or yellowish **eggs** about an inch and a half long are laid in cavities four inches deep dug by the females. Eggs hatch in late fall and the hatchlings overwinter in the earth before emerging in the spring. It is believed that hatchlings navigate to ponds at night by heading toward their bright, reflective surfaces. Painted turtles can be found in lakes, rivers, ponds, and reservoirs, and only occasionally in temporary ponds. Turtles are more populous in ponds with an abundance of basking sites, such as partially submerged logs. Adult painted turtles do not have may predators; hatchlings, however, must watch out for frogs, snakes, wading birds, and predatory fish. Although painted turtles overwinter in the mud at the bottoms of ponds, they are more active in winter than any other freshwater turtle species, and may be seen basking on warm winter days.

Snapping Turtle *Chelydraserpentina*

Snapping Turtles can reach a carapace (top shell) length of twenty inches and a weight of sixty pounds. **Males** have longer tails than **females**. Snapping Turtle **eggs** are perfectly round and slightly smaller than a Ping- Pong ball. Females can deposit up to eighty or more eggs, but twenty to thirty is more likely. Nests are commonly raided by raccoons and skunks. When **hatchlings** break free from their eggs, most leave the nest within a few days, but some groups will remain in the nest through winter.
Although snapping turtles can deliver a nasty bite, it is always in defense of a perceived threat.

Stinkpot *Sternotherus odoratus*

As their name suggests, Stinkpots release a fairly strong, foul odor when disturbed. **Males** have thicker, longer tails than females which also end in a sharp, naillike point. Although some Stinkpots dig nests, many simply deposit their one to nine **eggs** in rotting logs, muskrat lodges, or leaf litter. Because of their drab color and algae covered shells, Stinkpots can be difficult to spot, looking like rocks on the bottom of a pond. Stinkpots rarely bask out of water.