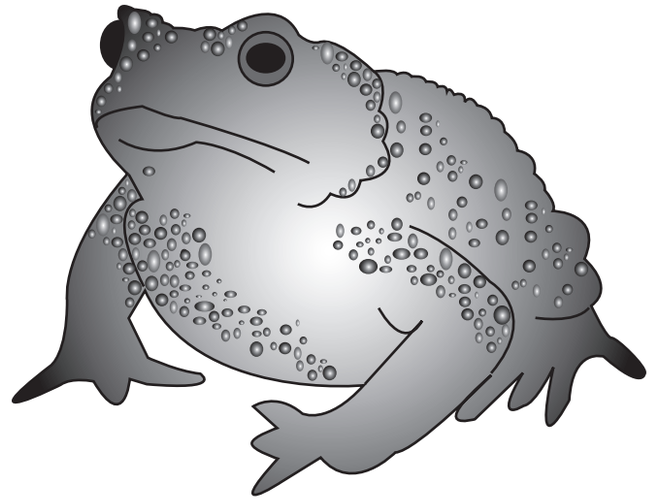
Toads Give You Warts—Not!



Terry Tomasek and Catherine E. Matthews

Abstract. The authors provide activities through which teachers can share experiences in the outdoors with young children and teach them about herpetology, the study of amphibians and reptiles. Outdoor activities include observation, classification, and mapping. The authors also include activities for the classroom, including connections between the science projects and art.

Keywords: amphibians, classification, outdoors, reptiles

"Toads give you warts." "The only good snake is a dead snake." With mantras like these, what is an elementary school teacher to do? The answer is easy: Take your students out of the classroom and into the field to experience the intrigue, the mystery, the challenge, and the beauty of the amazing number of reptiles and amphibians that share our world, all the while addressing the National Science Education Standards (National Research Council 1996; see Table 1) and having fun.

Over the years, we have worked with a variety of elementary school teachers to introduce reptiles and amphibians to second through fifth graders, and we have been successful at changing the negative images and unfounded fears that children often bring to the study of reptiles and amphibians. The best part of our work, and certainly a favorite of the children, is the fieldwork. Nothing can substitute for the experience of being in the outdoors and searching for reptiles and amphibians. We have made our work easier by creating artificial resting habitats and shelters for local species of reptiles and amphibians. We accomplished this by taking pieces of plywood, tin, and polyvinyl chloride (PVC) pipe and placing them strategically in the outdoors.

Once our boards and pipes are in place, the animals arrive, and it is time to bring the children. For specific, detailed information on creating artificial habitats, see Tomasek, Matthews, and Hall (2005). Throw out some plywood and tin and place some PVC pipes vertically in the ground near a wetland.

The purpose of this article is to describe our work in the field with children and *herps*, a collective name for reptiles and amphibians. We describe experiences you can provide for your students in the outdoors to help them learn basic science concepts. Toads, frogs, salamanders, snakes, and turtles are often overlooked for their value in teaching about biodiversity, niche partitioning, habitats, binomial nomenclature, biological classification, and animal adaptations.

Background

Frogs, toads, and salamanders are the more common members of the class Amphibia. The class Reptilia includes turtles, snakes, lizards, alligators, and crocodiles. Both classes belong to the phylum Vertebrata. Major differences

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Table 1. National Science Education Standards Addressed by the Activities in This Article

Science as Inquiry Standards (Grades K–12)

- Students develop an appreciation of the nature of science.
- Students develop the skills necessary to become independent inquirers about the natural world.
- Students have the opportunity to ask questions, plan and conduct investigations, and use appropriate tools and techniques to gather data.
- Students have the opportunity to think critically and logically about relationships between evidence and explanations, construct and analyze alternative explanations, and communicate scientific arguments.

Source. National Research Council. 1996. *National science education standards.* Washington, DC: National Academy Press.

between reptiles and amphibians can be found both internally and externally. Generally, reptiles have more developed respiratory and circulatory systems. Most reptiles have clawed feet and dry skin covered with scales, whereas amphibians do not. Most amphibians lay soft, unshelled eggs in water, and their young undergo metamorphosis to reach the adult stage. A Venn diagram can be used to help students remember the differences and similarities between amphibians and reptiles.

Amphibians are more important than most students probably think: They are biological indicators of the health of the environment. Because amphibians have semipermeable skin and live part of their lives in water, ecologists believe that declines in their populations may be early warning signs of broader changes in an ecosystem (Mitchell et al. 1999).

In the late 1980s, scientists came to realize that certain frog populations were declining and that some species had declined to the point of extinction (Green 2003). We still do not know if this is a natural fluctuation or if human beings are somehow responsible for the decline. Humans continue to alter the environment with practices such as draining wetlands, constructing new impoundments, introducing exotic species, and building new homes and industries, and scientists do not know how such behavior will impact amphibian and reptile populations. Scientists do know that these organisms are vulnerable to air and water pollution and that many of them are sensitive to environmental changes (Mitchell et al. 1999). We therefore feel it is critical to introduce students to these animals that share our habitat and let them see the plight that many of these organisms face.

Fieldwork

The following is a list of the simple yet powerful activities that we have conducted with elementary school students in the field.

- *Observing and recording data.* Working in groups, students record data about their observations. Teachers should create a data-collection form to reflect the appropriate data needed for outdoor fieldwork. See http://www.uncg.edu/soe/herpetology for data-collection forms that we have used with children.
- *Catching tadpole and salamander larvae with bare hands.* A favorite activity for students is to sit by a puddle or a water-filled rut in a dirt road and let the tadpole and salamander larvae swim into their hands. We tell our students that this is a basic competency; everyone must be able to catch tadpole and salamander larvae before we get to the *vernal pool.*[1]
- *Comparing tadpole and salamander larvae.* This is easier when students have held both types of larvae in their hands. The feathery external gills of the salamanders are easy to see, and students feel good about being able to separate the frog babies from the salamander babies (see Figures 1 and 2).

FIGURE 1. Salamander larva (left) and tadpole (right).

FIGURE 2. One tadpole (at the top of the container) and five salamander larvae.

- *Observing egg masses.* Spring is a good time to observe not only amphibian young but also their eggs in various stages of development. Students are fascinated with the amorphous mass of frog eggs that resembles an oil spill, the strings of toad eggs, and the large, softball-sized egg masses of the spotted salamander (see Figures 3 and 4). They also are delighted when the larval forms in the eggs move. Do not pick up or move the egg masses, or you may harm the young animals. Simply bend over or lie down and use a hand lens for a close view.
- *Identifying groups of organisms and specific species when possible.* We always try to help students identify the animals we find in the field. We bring field guides and share our knowledge of local species with the students. One of their favorite activities has been counting the dots in the warts of each toad to figure out if they are holding an American toad (two or fewer dots in each wart) or a Fowler's toad (three or more dots or bumps in each wart). We have had students enthusiastically argue over who would hold the toad and count the dots. Also, we have created simple keys that second graders have used to identify species in the field. The keys that we use to identify the amphibians where we live can be downloaded from http://www.uncg.edu/soe/herpetology.

  There are excellent Web sites on amphibian and reptile identification, and you should locate one that provides a guide to the reptiles and amphibians where you live. Two good Web sites are the North American Amphibian Monitoring Program (http://www.pwrc.usgs.gov/naamp) and Frogwatch USA (http://www.frogwatch.org).
- *Using scientific equipment such as aquatic dip nets and children's rakes to turn cover boards, logs, and rocks.* Our students enjoy using these tools to collect organisms or turn *cover boards*.[2] Younger children enjoy wearing the rubber boots we provide to stomp around outdoors. Small-size nets with about 2-ft handles work best for young children for dipping in low-water-volume areas such as vernal pools and water-filled ruts or other depressions. This also protects the integrity of the habitat.

FIGURE 3. Frog eggs.

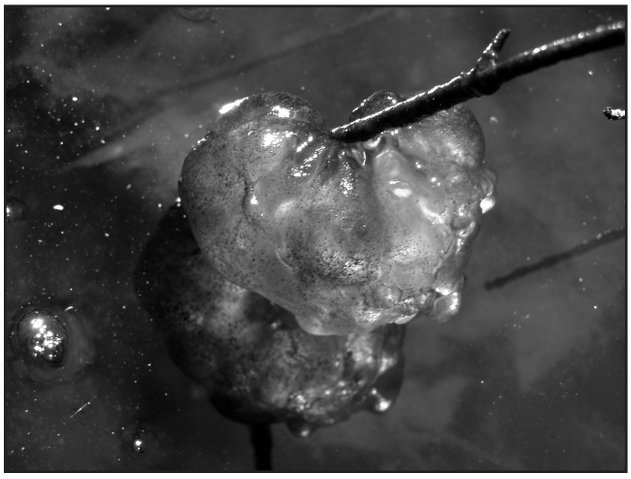

FIGURE 4. Spotted salamander egg masses.

Complimentary Classroom Activities

In our companion piece in this issue, "Using Reptile and Amphibian Activities in Your Classroom," we describe related science activities that we have used with children. Here we describe activities from other school subjects that we have used successfully before and after our fieldwork in herpetology.

- *Finding and identifying pictures of herps.* This is an activity that can be used with fieldwork to help students identify local species of amphibians and reptiles. Ask older students to use pictures from field guides or the Internet to accurately sketch and color scaled drawings of various amphibians and reptiles. Students should carefully color both the *dorsal* (back) and *ventral* (belly) views, paying close attention to all anatomical details. Cut out the pictures and laminate them. Ask older students to put the cutouts ("flat" herps) on the school property in appropriate habitat locations (salamanders under logs or tree frogs on trees). Our students also placed flat herps under pieces of cover board. Then, ask younger students to find and identify these herps using simple classification keys.
- *Mapping breeding habitat preferences.* Students collect data and chart when and where different organisms in the area breed. Observe ponds and vernal pools for breeding amphibians and look for nests of snake eggs under tin pieces. Use a yearly calendar to mark each species. Investigate and discuss with students the advantages for organisms to breed at different times of the year. For instance, some salamanders breed in the spring and others in the fall. This allows multiple organisms to use the same habitats at different times of the year, thus promoting the sharing of resources and reducing competition. Frogs and toads stagger breeding seasons

in the same way. For example, on the property where we conduct our fieldwork, the two most common toads are Fowler's toads and American toads; American toads breed early in the spring or late winter, whereas Fowler's toads breed later in the spring or early summer.

- *Mapping the distribution of organisms.* Once students have started to identify amphibians and reptiles, ask them to make dot distribution maps for individual species that they have found. Use a different map for each species identified. For each organism, place a dot on the map to indicate its location. Talk about animal migrations and the problems caused by roads and other features that may fragment a habitat. Ask students to analyze the maps for patterns. Why are certain organisms found in certain areas and not in others? If you color copy the individual species maps onto clear transparency film, you can overlay two species maps to study potential species interactions. Also, if you have access to the technology, integrate geographical information system (GIS) software. Compare your findings with those of other teachers who are collecting similar data.
- *Studying the art of M. C. Escher.* The graphic artist Maurits Cornelis Escher was famous for a variety of art forms depicting subjects such as sky, water, and reptiles. One of our teachers created a PowerPoint presentation on Escher's work, which features many drawings of reptiles and amphibians. More information about Escher and his work can be found at http://www.mcescher.com.
- *Producing works of art.* Ask students to make models of frogs, turtles, snakes, salamanders, or lizards that they saw on their field trip. Using clay or putty, students can make three-dimensional models of organisms they find in the field.
- *Taking photographs.* Ask students to carry digital cameras into the field. After students take pictures of each organism, they can make a pictorial directory of the amphibians and reptiles found on the property where they did their field studies.

Safety Concerns

See Table 2 for safety suggestions to protect both people and herps.

Table 2. Safety Suggestions to Protect People and Herps

To Protect People

- Know about venomous snakes, toads with toxins, or turtles that bite that you may encounter in your area. Make sure students know what to do if they come across these animals.
- Both students and teachers should wash their hands after handling herps.
- Have clear boundaries marked so that children do not wander away from you. Students should be able to see and hear you at all times.

To Protect Herps

- Avoid excessive handling of individual organisms.
- Release all animals at the location of capture.
- Use gallon-size plastic bags (e.g., Ziploc brand) or small plastic containers of water to temporarily hold animals.
- Use magnifying glasses or boxes to get a close-up view of animals.

Conclusion

There are many benefits to taking children outdoors. We have seen our students develop a greater appreciation for the environment and the variety of organisms living in the outdoors because of their participation in these activities. Second-graders changed from being a tromping herd of children plowing through the forest to a concerned citizenry. Frequently, we heard children say, "Watch out for that habitat!" as they pointed to a water-filled rut along the walking path. At the same time, students were able to sharpen their scientific research skills by observing; inferring; asking questions; collecting, classifying, and analyzing data; and communicating their results with one another.

The interdisciplinary nature of many of these activities deepened the learning experience for students. Although benefits to herps may not be seen in the present, we believe that a better-informed group of children will grow up to be adults who not only know about reptiles and amphibians but also respect the diverse populations of these animals. No longer will the "only good snake be a dead snake." Instead, they will see snakes as an important part of local species diversity.

Notes

1. A *vernal pool* is a depression that contains water for only part of the year. Because it periodically dries up, a vernal pool does not support breeding populations of fish, making it an excellent habitat for breeding populations of salamanders and frogs, whose eggs would otherwise be eaten by fish.

2. *Cover boards* are artificial materials (e.g., untreated plywood, galvanized roofing tin) that amphibians and reptiles use for shelter. Cover boards can be placed in wooded areas to attract amphibians and reptiles, making it easier to study these populations.

References

Green, D. M. (2003). The ecology of extinction: Population fluctuation and decline in amphibians. *Biological Conservation* 111 (3): 331–43.

Mitchell, J. C., T. K. Pauley, D. I. Withers, S. M. Roble, B. T. Miller, A. L. Braswell, P. V. Cupp Jr., and C. S. Hobson (1999). Conservation status of the southern Appalachian herpetofauna. *Virginia Journal of Science* 50 (1): 13–36.

National Research Council. 1996. *National science education standards.* Washington, DC: National Academy Press.

Tomasek, T., C. Matthews, and J. Hall. 2005. What's slithering around on your school grounds? *American Biology Teacher* 67 (7): 419–25.