Amphibian Alert!

A PUBLICATION OF THE
WORLD CONSERVATION UNION (IUCN)/SPECIES SURVIVAL COMMISSION (SSC)
DECLINING AMPHIBIAN POPULATION TASK FORCE
AND THE
AMERICAN ASSOCIATION OF ZOOS AND AQUARIUMS (AZA)
AMPHIBIAN TAXON ADVISORY GROUP

In Partnership with
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Dear Educator –

Welcome to ***Amphibian Alert!*** This curriculum aims to teach children what amphibians are and why amphibian population declines are important to scientists and communities throughout the world. The amphibian decline dilemma represents an outstanding opportunity for educators to introduce into the classroom a real-world problem that is being addressed by science. You need not be a science specialist to teach the *Amphibian Alert!* curriculum.

The enclosed packet contains:

- Background information for educators
- Three slide presentations
- Audio and video tapes
- The Salamander Room by Anne Mazer
- Sample posters and reading material
- Classroom lesson plans
- Field activities

The curriculum targets age groups from grades 2-5 (ages 7 – 11). However, many activities can easily be adapted for other ages and ability levels. The activities herein meet several of the content standards as outlined in the National Science Education Standards. The major thematic concepts woven into the activities are:

1. What are the characteristics of amphibians?
2. What characteristics put them at risk?
3. What is happening to amphibian populations worldwide?
4. Why should we be concerned, and what can we do?

Frogs are well loved by children, yet traditionally very little is taught in classrooms about frogs and other amphibians. Textbooks generally afford them very little space and we as adults greatly underestimate their role in nature. Meanwhile, these small but charming and ecologically important animals are disappearing from our world. Through *Amphibian Alert*!, children can learn that some current human activities have caused unforeseen problems for amphibians and that by changing our habits we can begin to live more harmoniously with these animals and the rest of the natural world.

You are welcome to reproduce any of the classroom lesson plans and field activities with credit to the originating institution and *Amphibian Alert!*. We welcome your comments and suggestions for additional activities that may be included in future publication. Feel free to contact us at kgraham@scz.org.

- DAPTF and AZA Amphibian TAG Education Committees

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Classroom Lesson Plans /Activities:

Field/Conservation Activities:

Amphibian Alert! National Science Education Standards Content Standards Alignment

In 1995, the National Academy Press published the first edition of National Science Education Standards (NSES). The project was directed by the National Research Council, and included many distinct organizations, including the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, the National Aeronautics and Space Administration, and the U.S. Department of Education. The purpose of the NSES document is to provide vision and pathways for all entities involved in science education.

Some school districts require teachers to provide links to the NSES standards and so, for your convenience, we have provided you with a quick reference to these standards and a table which allows you to see at a glance which standards are met by each activity within the Amphibian Alert! curriculum. Amphibian Alert! is intended for grades 2-5. NSES Content Standards are divided into the following grades: K-4, 5-8, and 9-12. The table below specifically references the K-4 standards presented in NSES. However, if you teach grades 5-8, the same content standards should apply.

The NSES publication (ISBN 0-309-05326-9) can be viewed at http://books.nap.edu/html/nses/html/index.html. A bound, paperback copy can be purchased from the National Academy Press, 2101 Constitution Avenue, N.W., Washington, D.C. 20418; tel. (202) 334-3313 or 1-800-624-6242.

NSES K-4 CONTENT STANDARDS

CONTENT STANDARD A: SCIENCE AS INQUIRY

As a result of activities in grades K-4, all students should develop:

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

CONTENT STANDARD B: PHYSICAL SCIENCE

As a result of activities in grades K-4, all students should develop an understanding of:

- Properties of objects and materials
- Position and motion of objects
- Light, heat, electricity, and magnetism

CONTENT STANDARD C: LIFE SCIENCE

As a result of activities in grades K-4, all students should develop understanding of:

- The characteristics of organisms
- Life cycles of organisms
- Organisms and environments

CONTENT STANDARD D: EARTH AND SPACE SCIENCE

As a result of activities in grades K-4, all students should develop an understanding of:

- Properties of earth materials
- Objects in the sky
- Changes in the earth and sky

CONTENT STANDARD E: SCIENCE AND TECHNOLOGY

As a result of activities in grades K-4, all students should develop:

- Abilities in technological design
- Understanding about science and technology
- Abilities to distinguish between natural objects and objects made by humans

CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

As a result of activities in grades K-4, all students should develop an understanding of:

- Personal health
- Characteristics and changes in populations
- Types of resources
- Changes in environments
- Science and technology in local challenges

CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE

As a result of activities in grades K-4, all students should develop understanding of:

- Science as a human endeavor

NSES Content Standards for Amphibian Alert! Activities

CLASSROOM ACTIVITIES	Standard A	Standard B	Standard C	Standard D	Standard E	Standard F	Standard G
1. Amazing Amphibians			X				
2. From Polliwog to Frog			X			X	
3. Tadpole Twist			X			X	
4. Stripes and Spots, Lines and Dots	*		X				
5. Creating Your Own "Salamander Room"			X			X	
6. Frog Leg Theater			X				
7. Soak it Up: Amphibian Skin	X	X	X			*	
8. Postcards from the Pond	*		X				
9. Caller ID – The Frog Mating Game			X			*	*
10. Back to the Pond – Habitat Fragmentation			X			X	
11. The Case of the Disappearing Frogs	X		X		*	X	
12. Lost Your Marbled Salamanders Board Game			X	*		X	
13. Where in the World are Amphibians Going?	X		X	*		X	
FIELD ACTIVITIES							
1. Taking Advantage of Local Resources						X	*
2. Nature is My Neighbor	X		X			X	
3. Creating a Frog-friendly Schoolyard	X		X		X	X	*
4. Getting Involved in "Frogwatch USA" and Other Counts	X		*			X	*

X = major emphasis on this standard

* = minor emphasis on this standard

Activity Summaries

Amazing Amphibians – Introduce your students to the diversity of amphibians through a variety of art, math, and physical education activities.

From Polliwog to Frog – By making a simple puppet, your students will learn about the stages of amphibian metamorphosis from tadpole to adult.

Tadpole Twist – Growing from a tadpole to adult amphibian isn't always simple – your students will experience some of the challenges in this active game.

Stripes and Spots, Lines and Dots – Amphibian skin may be brightly patterned or dully colored. Your students will learn how colors and patterns help an amphibian survive in this simple "camouflage" game.

Creating Your Own "Salamander Room" – Your students will transform you classroom into a "natural habitat" fit for an amphibian in this on-going art project.

Frog Leg Theater – Your students will create plays that depict scenes from an amphibian's life in a variety of habitats.

Soak it Up: Amphibian Skin – How is an amphibian's skin different from ours? Your students will discover in this activity that demonstrates the concepts of permeability.

Postcards from the Pond – Your students will put their research and creative writing skills to the test as they tell of their amphibian lives through postcards and ad campaigns.

Caller ID: The Frog Mating Game – Frogs are a very vocal group of amphibians – your students will learn how frogs find each other and how scientists use these calls to study populations.

Back to the Pond – Habitat Fragmentation – In this large-scale simulation game, your students will learn first hand the challenges that amphibians face on a daily basis as their habitats are fragmented.

The Case of the Disappearing Frogs – Your students will explore a "murder mystery" about disappearing amphibians and find that the list of "suspects" is extensive.

Lost Your Marbled Salamanders Board Game – Your students will experience the challenges faced by a North American amphibian in this simple board game. The game can be adapted to other local amphibian species.

Where in the World are Amphibians Going? – Amphibians are facing a myriad of problems around the world in nearly every type of habitat. Your students will discuss these problems and look for any patterns in this geography activity.

Taking Advantage of Local Resources – Contact local institutions and scientists to solicit their assistance in your Amphibian Alert! classroom programs and field activities.

Nature is My Neighbor – Nature is all around us – your students will explore their neighborhood and schoolyard for evidence of amphibians and other wildlife.

Creating a Frog-friendly Schoolyard - Your students will invite wildlife into their schoolyard in this on-going project that can involve parents, local businesses, and the whole school in transforming part of the grounds.

Get Involved in "Frogwatch USA" and Other Counts – Become part of a national program when your students participate in local amphibian population assessment studies through Frogwatch, USA.

Teaching Science

Engage! Explore! Explain! Elaborate! Evaluate!

"Bybee's Five E's" (Trowbridge & Bybee, 1990) has finally been embraced and reflects a major and exciting change in the way science is being taught. Gone are the days of memorizing exhaustive lists of facts. Facts are merely stepping-stones to true understanding.

Science should be viewed as a process that helps us understand the world. Science is an ongoing exploration in which it's okay for kids and teachers to say, "I don't know, but lets look for answers." Through inquiry the student generates his/her own questions. The teacher may guide students to questions. The role of the teacher is then to allow students to answer these questions via exploration. Teachers provide resources (this can be in the form of recorded media, text, discussions, activities, or experiments) and assist in exploration. After exploring, students (with the guidance of their teachers) begin to formulate answers/concepts and determine the strength of these answers/concepts. It's the teacher's job to identify misconceptions, and to tie the new concepts to a student's existing understanding of related concepts.

Science is something you DO. Students learn best through hands-on activities and science naturally lends itself to activity. In fact, it may be the ultimate integrator of activities. Reading, writing, social studies, history, art, physical skills, group projects, communications, mathematics, and just about any other skill imaginable are used to investigate science in real-life, meaningful ways.

Speaking of meaningful, science activities can be used as performance assessments that are fun and allow the student to better express themselves and their understanding of newly learned concepts. Traditional paper/pencil exams are one way of testing students, but certainly not the only nor necessarily the best way. A student can also express what he/she has learned by building and executing an experiment, creating models that represent what they have learned, by writing and performing in a play, or myriad other ways suggested by you, the teacher.

We suggest that you visit some of the following links that give background information and teaching strategies for current trends in science education. These models for science education are all based on brain-based research, and promoted by Project 2061 (AAAS), NSTA, and other educational institutions.

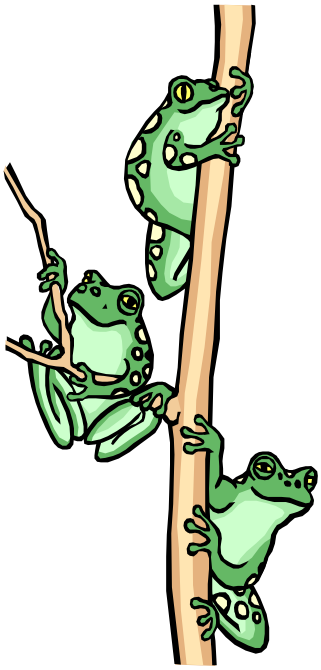
www.bscs.org/faq.html
www.nsta.org

What's an Amphibian?

The word Amphibian is derived from the Greek words "amphi" and "bios" which means both lives, and refers to the two stages of the amphibian life - aquatic larvae and terrestrial adult form. Amphibians are bare-skinned vertebrates that change form through a process called "metamorphosis." Around the world, in freshwater and on land, there are nearly 4,000 species of amphibians. They live on every continent except Antarctica, and they were around before the dinosaurs.

Although many variations exist, all amphibians typically begin life in the water as an egg surrounded by a jelly-like substance. From these eggs, they hatch into fishlike tadpoles. The tadpoles gradually transform into adults.

Salamanders have elongated bodies, smooth, moist skin and limbs without claws. They are found in damp habitats. Most live on land for part of the year, returning to the water to breed and lay eggs. The larvae of most species have external feathery gills that are resorbed as they mature into adults. Some stay in their larval form all their lives, staying in the water and keeping their gills. Salamanders are easily hurt by handling and should not be picked up if found in the wild.



Frogs and toads occur in many habitats from ponds to forests to deserts. These animals need water at some stage of their lives in order to breed and lay their eggs. Frogs are moist-skinned and need to be near moist habitats. Their numbers are declining in many parts of the world as a result of disease, pollution, introduced predators, and habitat loss. All frogs are hunters, but their prey range in size from tiny ants to birds, rats or even snakes! And when frogs are the ones being hunted, they have fantastic ways of protecting themselves. Some hide through camouflage, while others show "warning colors." Most have foul-tasting chemicals in their skin. Predators learn fast not to go after such a nasty-tasting meal.

Toads are bumpy-skinned frogs. They are a family of frogs that many people in North America and Europe have learned to distinguish from other frogs. However, there are many, many families of frogs.

Caecilians are also amphibians, but do not have legs at any stage in their life. Their skin has grooves that form rings around the body. Like all other amphibians, their lives are tied to moisture. They are only found in tropical regions of the world.

Amphibians are "cold-blooded" or ectotherms. Their body temperature is regulated by the air, soil or water temperature around them. In colder months some species hibernate and do not eat. Amphibians have permeable skin through which they breathe and absorb water. Unfortunately they can also absorb toxic pollutants carried by air and water.

*** information adapted from John G. Shedd Aquarium **Frogs!** curriculum*

Amphibian Alert! Vocabulary List

Amphibian - A group of animals that have backbones, well developed brains, and permeable skin. Amphibians have two phases of life, a larval phase and an adult phase. The major groups of Amphibia are caecilians, frogs, and salamanders.

Aquatic - Living in water. Amphibian larvae are usually aquatic. Some amphibian adults are also aquatic.

Biodiversity - All the kinds of plants and animals within a region or in the world - including the habitat in which they live, because they are all unique - every single individual and every community.

Bio-indicator - A plant or animal that helps us assess the health of a habitat. Amphibians are believed to be good bio-indicators because they have permeable skin and are sensitive to changes in water (as larvae) and on land (as adults).

Caecilian - One of a group of amphibians that have no arms or legs because they are adapted to a burrowing life-style. Caecilians are only found in tropical areas of the world.

Camouflage - Body coloration pattern that helps hide an animal within a habitat. **Cryptic coloration** patterns help blend the animal with the habitat, while **Disruptive coloration** mis-leads a predator by breaking up the body outline.

Diurnal - Active during daylight.

Ecosystem - The relationship between plants and animals and the habitat in which they live.

Frog - One of a group of amphibians that have strong back legs that are specialized for jumping and swimming. Frogs do not have tails. Tree frogs, true frogs, dart-poison frogs, toads, and flying frogs are examples of frog families.

Gill - Oxygen-gathering tissue located on the head and used by fish and larval amphibians. Gills are usually replaced by lungs when an amphibian metamorphoses, though some salamanders retain gills as adults.

Habitat - The place where a plant or animal lives. Soil, rocks, plants, animals, water, and weather help to make different types of habitat**.** Habitat **fragmentation** occurs when the habitat is broken into small, non-continuous sections. Habitat **degradation** occurs when the overall health of the habitat is lowered.

Larva - Juvenile form of amphibians. Larval frogs are also called “tadpoles” or (more casually) “polliwogs.” More than one larva are called larvae.

Larval - Referring to the juvenile stage.

Lung - Oxygen-gathering tissue located in the chest and found in most adult amphibians.

Metamorphosis - The process by which amphibians change from larvae to adults.

Migration - The seasonal movement of an animal from one region to another for breeding, hibernation, or feeding.

Nocturnal - Active at night. Most amphibians are nocturnal.

Permeable - Having pores that allow fluids to pass through. Amphibians have permeable skin. Water and other substances (including pollution) can pass through their skin. Oxygen can also pass through permeable skin. Some amphibians (certain terrestrial salamanders) have no lungs or gills and breathe entirely through their skin.

Salamander - One of a group of amphibians with arms and legs that are about the same size and shape. Salamanders have long tails.

Secretion - Fluid that flows onto the skin out of skin pores.

Tadpole - Frog larva. Tadpoles are more specialized than larval salamanders. They begin with a strong tail for swimming and a round body for holding lots of food. As they develop, they grow back legs, then front legs, and their tail is resorbed.

Terrestrial - Living on land. Most amphibians live on land as adults.

Toxic- Relating to a harmful chemical that can cause illness or death.

What's happening to Amphibian Populations Worldwide?

Declining Amphibian Population Task Force (DAPTF)

The DAPTF was established in 1991 by the Species Survival Commission (SSC) of the World Conservation Union (IUCN). The DAPTF operates through a network of Regional Working Groups. Around 90 of these represent different regions of the world and collect geographical data on amphibian declines and their causes. The DAPTF Office seeks to maintain best practice and consistency of methodology among these groups. Other issue-based Working Groups are concerned with specific topics, including: Disease and Pathology, Monitoring Techniques, Chemical Contaminants, Climatic and Atmospheric Change, and Captive Breeding.

Over the last 50 years, people have seen different types of amphibians that were once common become rarer and rarer. Some types of amphibians have disappeared off the face of the Earth. With some types of amphibians, the drop in numbers can be linked to local human activities (for example pollution of a stream or pond or the destruction of a natural area). Within the past 20 years, however, scientists have noticed population declines and extinctions in places where there is no obvious human activity. Frogs and other amphibians have declined or disappeared from areas that appear to be untouched like national parks and wildlife refuges. These changes in amphibian populations have led scientists to believe that a variety of factors may be causing these declines.

Why do amphibian declines matter? While the overall loss of biodiversity should be a cause of concern for all of us, disappearing amphibians are especially significant for many reasons:

- *As a measure of the health of the environment*
- *As an important component of many ecosystems*
- *As a source for potential medicines and other products*
- *As a source of beauty and wonder*

As a measure of the health of the environment
The current global loss of biodiversity is due to the activities of a single species - human beings. As we continue to modify the environment, our destruction of habitats causes other species to disappear. More recently, we have begun to observe more subtle impacts that human activities may be having on a global level. We have depleted atmospheric ozone levels; pollutants are accumulating in the natural systems on which we and other organisms depend; we may be altering weather patterns and accelerating global warming. Such gradual, but fundamental changes are certain to have an affect on the ecosystem.

As an important component of many ecosystems
Scientists and other people are also concerned about how amphibian extinctions and population declines will affect the balance of nature. In many parts of the world, amphibians may be one of the most common types of vertebrate. In some habitats, such as the temperate forests of eastern North America, the total weight of amphibians in an area may be greater than all other vertebrates combined. In the Upper Amazon, more than 80 species have been recorded at a

single site, which is more than twice the number found throughout all of Europe. In some habitats, particularly in warmer regions, the larger biomass of amphibians makes them significant prey for, and predators of, other species. Disrupting the food web impacts numerous species. If an amphibian species declines or goes extinct, what will happen to the animals that depend upon them as food?

As a source for potential medicines and other products
Many of the medicines we use today were derived from animals or plants. The extinction of an amphibian species may also mean the loss of a potentially important drug. Various poisons, produced in amphibian skin glands have been the source for important medicines. Sticky substances secreted by amphibians are being tested as a "surgical glue." Some species of amphibian may become extinct before we have had the chance to know their potential to help us.

As a source of beauty and wonder
Many people enjoy the beauty and wonder of the different shapes, forms, and colors that amphibians exhibit. Amphibians can be extremely beautiful, with striking coloration patterns. Even some of the less attractive species enjoy considerable public popularity.
The loss of an amphibian species can be a tragic event as this source of wonder, awe and beauty is lost forever.

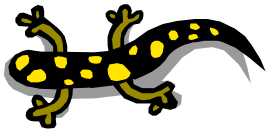
There are many reasons that everyone should be concerned about amphibian extinctions and population declines. Many people around the world believe that it is simply wrong for human activities to cause any type of living organism to go extinct. People who feel this way believe that we should act in a manner that prevents other animals from becoming extinct and to work to save animals that are threatened with extinction from the action of humans.

People have also suggested that amphibian extinctions and population declines should be considered a warning. Amphibians are very sensitive to harmful changes in their environment. When such changes happen, amphibians are among the first animals to suffer. However if things do not change for the better, the things that are killing amphibians may start to harm humans and other animals.

- *Fact Sheet from the Declining Amphibians Population Task Force (DAPTF)*
- *Visit their website for current information, FROGLOG newsletter and links to other sites concerned with amphibian conservation and study.*
- *http://www.open.ac.uk/daptf*

Zoo and Aquarium Efforts to Conserve Amphibian Species

Zoo and aquarium professionals of North America recognize their role in the conservation of vanishing species. Networked through the American Association of Zoos and Aquariums (AZA), these professionals develop and enact programs to help protect endangered animals. They work cooperatively with national and international governmental agencies, universities, and other expert advisors to assure the success of these projects.



Taxonomic Advisory Groups or TAGs are committees of zoo professionals of who select animal species that are in need of conservation programs and that can benefit from zoo efforts. It is generally a priority that the species selected are ones that can also be exhibited at zoos to serve as ambassadors at participating institutions. Species that are determined to be of highest conservation priority are managed within a Species Survival Plan® (SSP®), a rigorously structured protocol developed by the AZA. A relatively small number of species can be assisted b zoos (remember, there are approximately 4,000 species of amphibians). Therefore, it is always a priority that each conservation effort provides an education experience that expands beyond the protection of the single species and promotes the need for all people to value their natural resources.

The Amphibian TAG's longest-=running amphibian conservation effort is the Puerto Rican Crested Toad SSP®. This project began in the mid-1980s. Toads are bred in captivity and tadpoles are released in the wild. Artificial ponds have been built to replace lost habitat. Habitat conservation and restoration is in progress. Scientists and students monitor populations and community members are taught to distinguish between this toad and an invasive species that was introduced to the island. Educational videos, activity books, posters, and life-size models are distributed in Puerto Rico. Other species that the Amphibian TAG has worked to protect include the Wyoming Toad, Madagascar Tomato Frog, Blue Poison-dart Frog (Surinam), Texas Blind Cave Salamander, and the Golden Frog (Central America).

***Fact sheet based on information from American Zoo and Aquarium Association*
www.aza.org

Amphibian Alert! Slide Presentations

The Amphibian Alert! Curriculum Package includes three slide presentations. Each slide presentation has approximately 20 slides and a script to accompany it. Using one or more of the presentations before employing the classroom activities can provide students with some background knowledge and maximize the value of each activity for the student.

The first presentation provides an overview of the diversity of amphibians. The second presentation focuses on amphibian life cycles with an emphasis on egg and tadpole stages. The final presentation covers where amphibians can be found and threats to their continued survival.

While these presentations can be used at many times during this curriculum, Presentation #1 is listed as an introductory segment for Amazing Amphibians. Presentation #2 should be shown before or after From Polliwog to Frog and Presentation #3 should be shown before the class completes Frog Leg Theater.

Photo Credits**:**

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- **R. Andrew Odum** - 3, 20, 21, 23, 24, 25, 42, 45, 46, 47, 52
- **William Leonard** - 15, 16, 17, 18, 19, 26, 27, 28, 29, 43, 59
- **Will Brown** - 1, 6, 14, 30, 31, 48, 49, 50, 56
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- **James H. Marlett/Sedgwick County Zoo** - 22, 40
- **Dr. Ronald A. Nussbaum** - 13, 33
- **George Grall/National Aquarium in Baltimore**- 8
- **Richard S. Reed** - 35
- **Marvalee H. Wake** - 12
- **Suzanne L. Collins/CNAAR** - 32
- **Robert G. Sprackland, Ph.D/Virtual Museum of Natural History at curator.com** - 34

Presentation #1: Meet the Amphibians

Background: What is an amphibian?
Animals with backbones are called vertebrates. Scientists have discovered more than 43,000 different types, or species, of vertebrates alive today. Of the 43,000 vertebrate species, about half of them are fish. The remaining 24,000 species are amphibians, reptiles, birds, and mammals. About 4000 species of the land-dwelling vertebrates are amphibians. The amphibians are made up of 3 different groups: (1) the frogs, (2) the salamanders, and (3) the caecilians. Since most amphibians spend their time hiding, and often only come out at night, scientists are sure that there are many, many more species of amphibians that have not been discovered.

What makes an amphibian different from all other vertebrates? Amphibians are covered with smooth moist skin. They do not have scales, hair, or feathers. Like all animals, they need water to survive, but unlike us, they do not drink with their mouths. Instead, they absorb water through their moist, delicate skin. Amphibians can also use their smooth moist skin as a way to breathe! Amphibians have two major life stages: An aquatic (water-dwelling) larval stage, and a terrestrial (land-dwelling) adult stage. To make things even more confusing, not all amphibians move onto land as adults, but instead spend their whole adult life in the water. Amphibians get their name from their two-part life. Amphibian actually means "both-life."

Frogs:
Of the 4000 or so known amphibian species, about 3500 of them are frogs or toads. Along with having the largest number of species, this group has the widest variety of shapes and lifestyles. Here are some examples:

1. Pickerel Frog - True frog family
Frogs have big back legs and have bodies made to jump. Some frog species have bigger back legs than others.

2. White Spotted Narrowmouth Frog - Narrowmouth frog family
Frogs with legs that aren't as big, walk or make short hops rather than long jumps.

3. American Toad - Toad family
Most toads have bumpy skin and back legs that are smaller than the back legs of other frog families.

4. Mossy Frog- Old world tree frog family
Some other frogs have bumpy skin too.

5. There are frogs that live on the ground, in water, in plants, and high up in the trees. The frogs that swim the most have webbed feet, like flippers, to help them swim through the water.

6. Waxy Tree Frog - Tree frog family
Many frogs that climb have toes that act like suction cups, helping them hold on. Some frogs have brightly colored skin and some don't.

7. Spadefoot family
Spadefoot toads use the bony structures on their back feet (their "shovel" or "spade") to burrow backwards into the ground. Like many types of frogs, spadefoot toads are colored so that they can hide in their habitat.

8. Phantasmal Dart Poison Frog - Dart Poison Frog family
Some frogs keep predators from eating them by making terrible tasting chemicals (or even poisonous chemicals) in their skin. When a predator tries to eat them, it gets a terrible taste in its mouth. Some frogs are also brightly colored to help warn birds and other predators that they taste bad. Many animals use bright warning colors, like red, yellow, and orange, to help warn predators. Bees and wasps use bright colors also. So do some poisonous butterflies. These warning colors are a universal language in the animal kingdom.

9. Tree Frog family
Some frogs have colors that help them blend in with their habitat when they are resting, but when they stretch out to jump, their warning colors show. Notice the toe pads that help this tree frog hold on tight to branches and leaves.

10. Toad Family
Some frogs look really weird. This toad looks like a fallen leaf when seen from above and guess what? It hides in fallen leaves.

Caecilians:
11. South American caecilians
Most people don't know anything about this group of amphibians. Scientists have seen about 160 different types of caecilians, and think there are many more species they haven't discovered yet.

12. Old World caecilians
Caecilians don't have arms or legs. Their eyes are often covered with skin. Caecilians are hunters and find their food using their excellent sense of smell. When you look at a caecilian, you would think that you were looking at a large worm. But caecilians are amphibians with a backbone and a complex brain.

13. African caecilians
Caecilians are only found in the tropics. There are none in the United States or Europe. Some caecilians are terrestrial, meaning that they live on land. Most are found underground, burrowing through the soil much like worms. Other caecilians are aquatic, meaning that they live in the water. The aquatic caecilians live at the bottom of streams, swamps, and lakes.

Salamanders:
Most salamanders have four legs and a long tail. They look like lizards, but they're not. Lizards are reptiles that have dry skin, scales, and lay shelled eggs on land. Salamanders, like other amphibians, lay their eggs in or near the water, and their eggs don't have shells. Baby salamanders live in the water and breathe through gills. Adult salamanders may keep their gills (aquatic species) or lose them and develop lungs so that they can live on land (terrestrial

species). There are even some terrestrial species that don't have lungs or gills. They live in moist habitats and breathe through their skin! Can you believe it? All amphibians breathe through their skin a little bit, but only one family of salamanders that lives on land has no lungs as an adult, and breaths only through its skin. There are many families of salamanders. The next few pictures show some of these families.

14. Mole salamander
These fat, smooth-skinned salamanders live up to their names. Most of the mole salamanders, like this spotted salamander, spend much of their lives underground.

15. Siren
These strange looking salamanders look a lot like eels. Sirens have no back legs but, if you look closely, you can see their tiny arms. Sirens spend their adult life in water and keep their gills throughout life.

16. Hellbender
Hellbenders live in the United States, and are some of the largest salamanders in the world. They can grow to be two feet long. Hellbenders have closely related cousins that live in Japan and China that can grow to be four feet long! They spend most of their lives in cold rocky streams and rivers. Hellbenders have very wrinkly skin. Air bubbles get trapped in the wrinkles. These bubbles give the hellbender extra oxygen so that they can stay under water for a long time.

17. Mudpuppy
Mudpuppies are totally aquatic and keep their gills as adults.

18. Lungless salamander
Lungless salamanders have evolved bodies that breathe entirely through their moist skin. All amphibians can get some oxygen into their bodies through their skin, but only the lungless salamanders can get all that they need this way. These salamanders are very small. Some species of lungless salamander live on land, while others live in water.

19. Lungless salamander
Most lungless salamanders, like this red salamander, live in the cool woodlands of the Appalachian Mountains of the southeastern United States.

Frogs, caecilians, and salamanders make up the amazing world of amphibians. Some of the adaptations that help amphibians survive are now putting them at risk. In the last fifty years, scientists have noticed that some types of amphibians are disappearing. They are no longer found in certain places, and some species have disappeared entirely, meaning that they are probably extinct. We will learn more about amphibians, threats to their survival, and what you can do throughout this curriculum.

Presentation #2: Life Part One: Eggs and Larvae

One reason amphibians are so special is that they have two major stages in their lives: a water dwelling (called aquatic) stage and a land dwelling stage (called terrestrial). In fact, the name amphibian literally means double life. During the aquatic part of their lives, amphibians aren't adults yet. We call these immature amphibians larvae. During the aquatic larval stage, the baby amphibian's main job is to eat and grow and not get eaten. The larval amphibian's body is specially designed for this job. Once the larva is big enough, it changes into the adult stage. The changes that happen in an amphibian when it goes from the larval to the adult stage are amazing - almost hard to believe.

20. Amphibians have jelly-like eggs that are usually laid in water.

21. These eggs may not look like eggs that you are used to seeing. They are not covered with a shell like a bird egg or a reptile egg. Instead, the group of eggs is held together with a clear goopy substance that helps hold in water and keeps the eggs safe. This gooey stuff looks and feels like raw egg white. If amphibian eggs are not laid somewhere that is wet or moist, they will dry out and die.

22. Some species of amphibian, like this one, lay only a few eggs.

23. Most species of amphibian lay lots of eggs at once. Some even lay thousands of eggs at once!

24. Most of the frogs in the toad family...

25. Lay their eggs in long strands, almost like beads on a necklace. The strands of eggs are wrapped around aquatic plants.

26. This amphibian can lay its eggs on land, but the eggs must be kept very moist. This amphibian looks like a lizard, but it's not. It's an amphibian called a salamander. This salamander laid her eggs in a very damp area of her forest home.

27. These salamander eggs are almost ready to hatch. While it is in the egg, we call the amphibian an embryo. When the egg hatches, the embryo is called a free-swimming larva. Notice the feathery things on the side of the face? These are gills that help the larva breathe in the water.

28. Here is a larval salamander with big bushy gills.

29. Here is a closer view of the same salamander.

30. After a while, most salamanders absorb their gills into their body and start breathing air with lungs. This is part of the change that happens to the larvae. It means that they are about ready to move onto land to live their adult life.

31. One family of salamanders, called the newts, doesn't follow the same plan as most salamanders. Newts have egg and larval stages just like other families of salamanders; but they also have a juvenile "eft" life stage that lives on land.

32. Then when they become adults, they move back to the water and become aquatic again.

33. Very little is known about the group of amphibians called caecilians. Some caecilian species lay eggs, while others give birth to live young. Here is a mother caecilian with three babies. The babies are miniature versions of the adult.

34. Here is a model of a mother caecilian with eggs. A mother caecilian with eggs has never been photographed. That is how secretive they are!

35. Most frogs lay eggs and their larvae are called tadpoles. These embryos are just about to hatch out of their eggs and become free-swimming tadpoles.

36. When a tadpole hatches from the egg, it doesn't have any legs at all. Tadpoles have a strong tail for swimming and a body that holds a big stomach and gut for eating lots of food. Tadpoles eat small aquatic plants called algae. Some also eat small aquatic animals, such as mosquito larvae. Some even eat each other!

37. Soon, tadpoles begin to grow hind legs.

38. Next, they grow front legs. Their mouth and eyes begin changing and they start to look like an adult frog. At this point, the tadpole quits eating. It gets its energy from its tail. The tail is slowly absorbed into the body.

39. The tadpole's tail gets smaller and smaller. It gets adult coloring and moves onto land. Once on land, the young frog begins feeding on its favorite food - insects!

Presentation #3: Life Part Two: Adults and Amphibian Habitat

40. Amphibians live in almost every habitat in the world, except oceans and the polar ice caps. Though amphibians live all around us, we often forget about them. However, when their breeding season is upon them, frogs remind us that they are almost everywhere.

41. Male frogs call to attract female frogs. The calls that frogs make are different for each species. This allows females to make sure that they are going to reproduce with the correct species of frog.

42. Females find the calling males of the correct species. The male frog then grips the female frog from behind in a kind of hug. Scientists call this hug amplexus. The female lays her eggs during amplexus. The male frog fertilizes the eggs with his sperm after she has laid them.

43. Salamanders do not call to attract mates. They find each other with their great sense of smell. These newts are amplexing under water.

44. Most of the world's frogs are found in tropical forests, like this one. Within one small area of forest, many species of frog are found living in their own habitat. Special parts of a large habitat that a species lives in are sometimes called microhabitats. Examples include:

45. in trees...

46. on leaves...

47. and on the forest floor.

48. There are more kinds of habitat than we can ever imagine. Here are three aquatic habitats that are different from each other.

49. A slow-moving, shaded stream in a warm region.

50. A cold, fast-moving stream at the base of a mountain.

51. A still pond, filled with plants.

52. Each of the thousands of different type of amphibians are adapted to living in certain habitats. When human activities change their habitats, which are their homes, breeding spots, and food supplies, different types of amphibians may become threatened or endangered. There are many ways that humans harm amphibian habitats. One way is allowing pollution to get into the water.

53. Another is by changing the flow, depth, and path of water to suit human needs. A dam blocks the flow of water.

54. Changing the water changes the habitat. Sometimes these changes make the habitat too different for amphibians to live in. Some kinds of amphibians may still be able to live in changed water. Others can't. Ditches control floodwater. Some frogs that would normally breed in shallow areas of floodwater cannot breed as well in the deep water of this ditch.

55. Amphibians may become endangered when fish that eat amphibians are released in the ponds and streams they once safely lived in.

56. Removing the rocks and gravel from the bottom of streams and rivers put some types of amphibian at risk.

57. Building homes and other buildings often destroys habitats that are crucial to the survival of some amphibian species.

58. Amphibians will not be able to use this habitat any more.

59. If amphibians are to survive, we must leave some habitat for them.

Why should we care about amphibians?
Amphibians are cool! Besides, they eat lots and lots of insects. And amphibians provide food for other animals, too. If the amphibians disappear, who will eat all of the insects? What will the animals that prey on amphibians eat?

Amphibians also tell us if we are taking good care of the environment. Because amphibians have sensitive skin, live in water and on the land, and require special habitats, their presence tells us if their habitats are healthy. If the amphibians start to disappear, it is a message to us that something is wrong.

"The Last Frog"
National Geographic EXPLORER Production
Produced and Directed by Allison Argo, 1996, 28 min

Teacher Note: This program can be shown in conjunction with a number of Amphibian Alert! activities, depending on the age level of your students. Please preview the program to determine when is the best time to use it with your class.

Potential discussion starter questions:

- *What are some of the potential reasons why amphibians are disappearing?*
- *How are scientists studying these causes?*
- *How are concerned citizens trying to help amphibians in their neighborhoods?*

Colorful, diverse and brilliant at adaptation, frogs have been masters of survival for millions of years. With more than 4,000 species known today, frogs have adapted to amazing extremes, evolving into one of the most far-flung and varied group of animals on earth. But a strange pattern has begun to develop. Frog species have suddenly and mysteriously begun to vanish – they may be highly sensitive to population and environmental change. A lot of people haven't given much thought to frogs since high school biology class, but now the creatures are doing a strange disappearing act and nobody seems to know why. Producer Allison Argo spent more than a year filming frogs for National Geographic EXPLORER's "The Last Frog".

"I fell in love with frogs on this project, but they can be very frustrating subjects! They're masters of camouflage, most are nocturnal, and they like to come out in the rain—not exactly optimal filming conditions. They're pretty secretive creatures, and good escape artists, too! But we worked with some wonderful biologists who have an uncanny ability to find frogs, and in the end we filmed about 30 different species. Two of my favorites that we filmed were a beautiful Ecuadorian poison dart frog that looks like Spiderman, with a red and white striped body and blue polka dotted legs, and a wonderful barking tree frog that lives right here in the U.S."

- *Allison Argo*

About Allison Argo:
As a Producer, Director and Writer, Allison Argo has won numerous awards including Emmy, Dupont-Columbia, Genesis, Chris, Cindy Gold, CINE Golden Eagle, Jackson Hole and Missoula International Wildlife Film Festival awards. In addition, over the past seven years Argo has received eight national Emmy nominations. THE LAST FROG, was awarded a national Emmy as well as "Best of Festival" at the Missoula International Wildlife Film Festival and Best Short Film at the Jackson Hole Wildlife Film Festival.

Based in Washington, DC, ArgoFilms Ltd. is dedicated to finding innovative ways of bringing message-driven films to mainstream television.

This program is not available commercially and has been provided through the generosity of the Producer and National Geographic EXPLORER.

Amazing Amphibians

Introduce your students to the diversity of amphibians through a variety of art, math and physical education activities.

Objective: to increase students' appreciation and awareness of the variety of sizes, forms, and lifestyles of amphibians. ** *Slide Presentation #1- Meet the Amphibians should be used before or after this lesson plan, depending on the level of the students.*

Vocabulary: amphibian, frog, salamander, caecilian, aquatic, terrestrial

Background: Following an introduction to the world of amphibians and defining characteristics that make them unique using the Vocabulary list and/or slide presentation #1, your students are encouraged to create some amphibians of their own. But be careful, for all amphibians are not the same! They come is all sizes and shapes with an amazing variety of skin colors. They leap or hop on the ground, climb in the trees, hide under rocks, even burrow underground. The following pages contain line drawings of various amphibians. Your students will need to do some research to find out their actual size, color pattern, and an interesting fact or two on their lifestyle. You and your students can use these master sheets for a number of activities. Below are listed three ways to use them, but don't let that restrict you! Feel free to be creative and find other uses. Remember - make enough copies so you don't use the master set by mistake!

Related Subjects: math, physical education, art

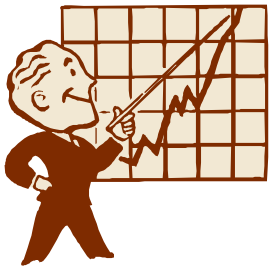
Materials: copies of master set of drawings for students, shirt hangers and yarn (for mobiles), tape measure (for frog jumping), paper and pencil (for math problems and research)

Procedures:
Make copies of enclosed line drawings:

- Leopard frog
- Eastern spadefoot toad
- Hellbender
- Striped newt
- Goliath frog
- Siren
- Bullfrog
- Caecilian
- Tiger salamander
- Spring peeper
- Wyoming toad

Break class into small groups to research each of these animals. Research can be done with reference books, field guides, and on the Internet. Student teams should work together to find out the size of the animal, its color pattern, and native habitat. Bring back results to share with entire class. These results will be used in many of the following activities and projects.

Amazing Amphibians Math problems:



1. Create a chart of sizes, ranging from smallest to largest of the amphibians the class researched.

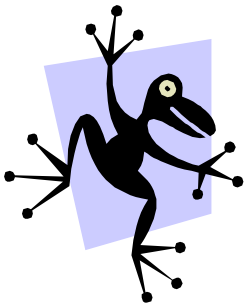
2. Compare the sizes of one of the largest and one of the smallest amphibians in the world - Giant Japanese Salamander which can get to nearly 5 feet in length and weigh 88 pounds. Smallest poison dart frog is ½ inch in length, no bigger than a thumbnail.

3. If a leopard frog has 200 tadpoles each year, how many frogs would be born in

   5 years? _____ 15 years? _____ 22 years? _____

4. The record for a bullfrog jump is 21 feet, 5 inches. How many jumps would it take to cross a football field that is 100 yards long? (for younger students, use multiple choice answers)
   a. 5 leaps b. 14 leaps c. 20 leaps d. 25 leaps

5. The record jump for any frog is the South African sharp-nosed frog. This frog jumped 33 feet, 5 inches! How many leaps would this frog have to take to cross the football field? (for younger students, use multiple choice answers)
   a. 3 leaps b. 7 leaps c. 9 leaps d. 12 leaps



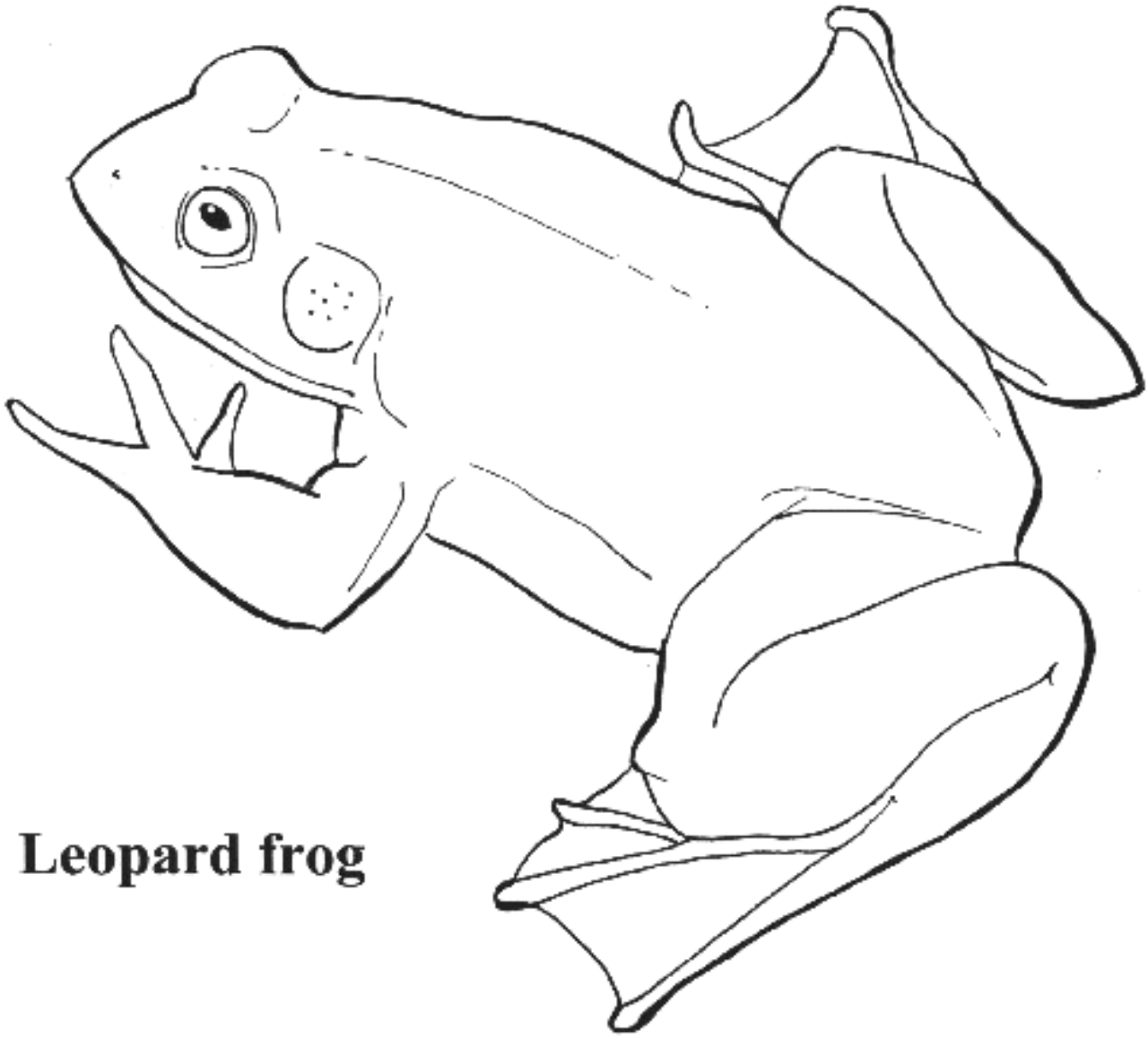
6. Some of these jumps are about 20 times the length of the frog. How tall are you? _____ feet, _____ inches
   How long would a jump 20 times your height be?
   _____ feet, _____ inches

Amazing Amphibians Physical Education activities:

Hold a frog-jumping contest in the school yard or a large room. Have the students measure out a straight area to use for the jumping. All jumps are from a standing position, so they need to make a starting line. Have the students do all the measuring (with a tape measure) and recording of results. Each student can have two turns to get their best jump. Compare their results with the bullfrog (21 feet, 5 inches) and the South African sharp-nosed frog (33 feet, 5 inches). Note results for all students and create a chart back in the classroom.

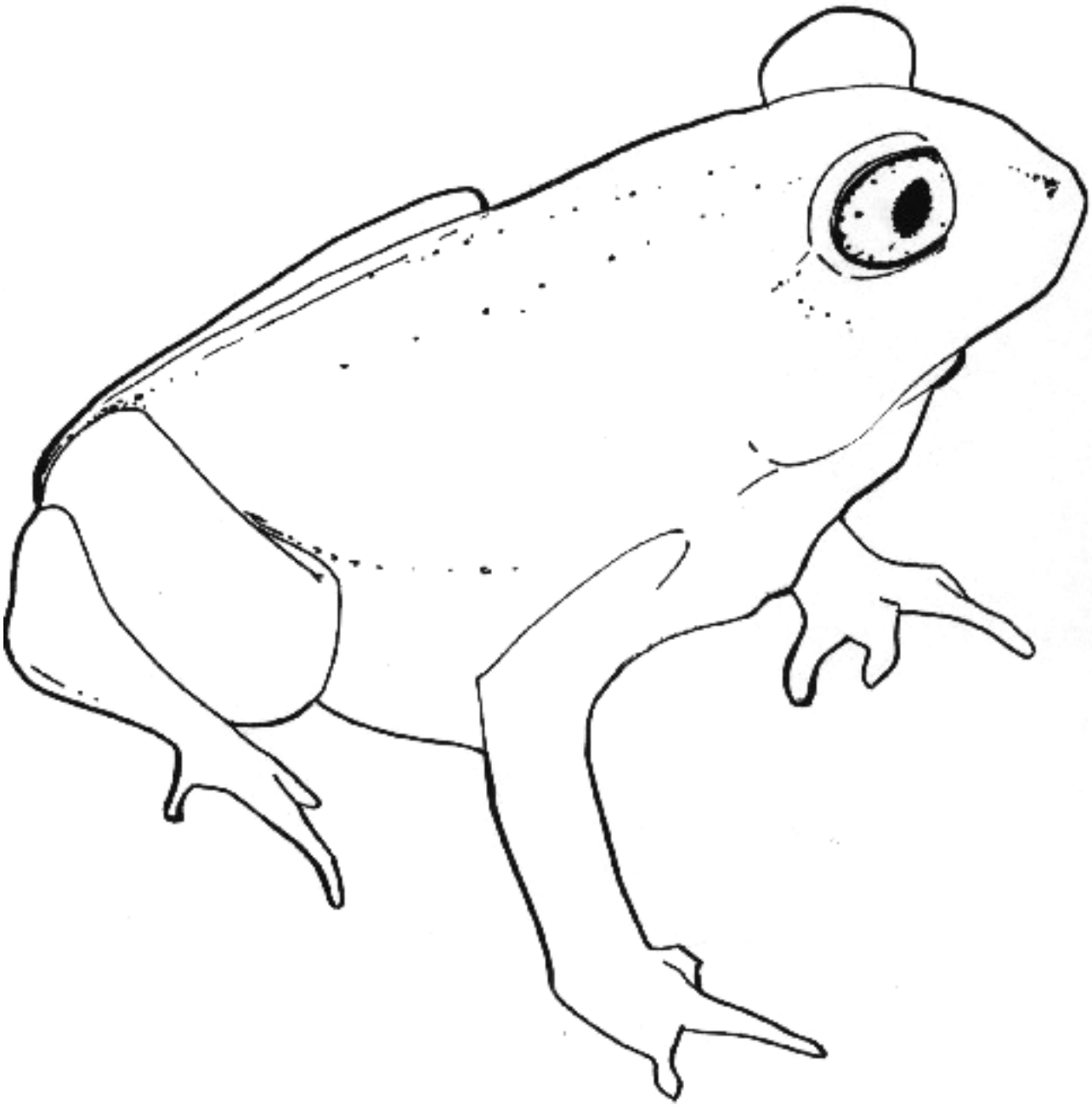
Amazing Amphibian Art activity:

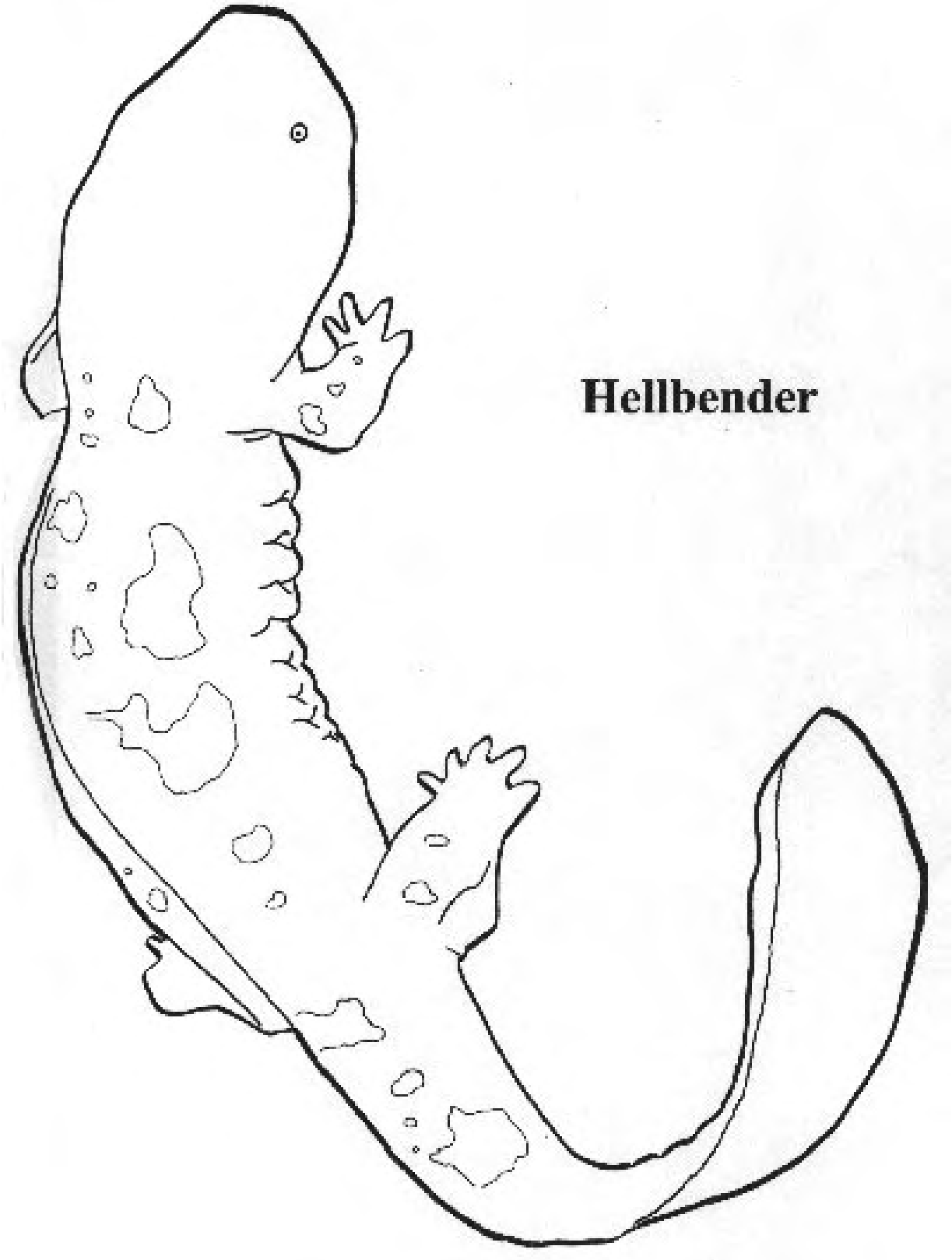
Create a mobile to illustrate the variety of amphibians. Use the master drawings supplied and research to color in each amphibian accurately, then cut them out. (You may want to make 2 copies of each, then glue together so the mobile has two sides.) Use yarn to attach the cut-outs to a coat hanger or dowel to create a mobile and hang it in the classroom.

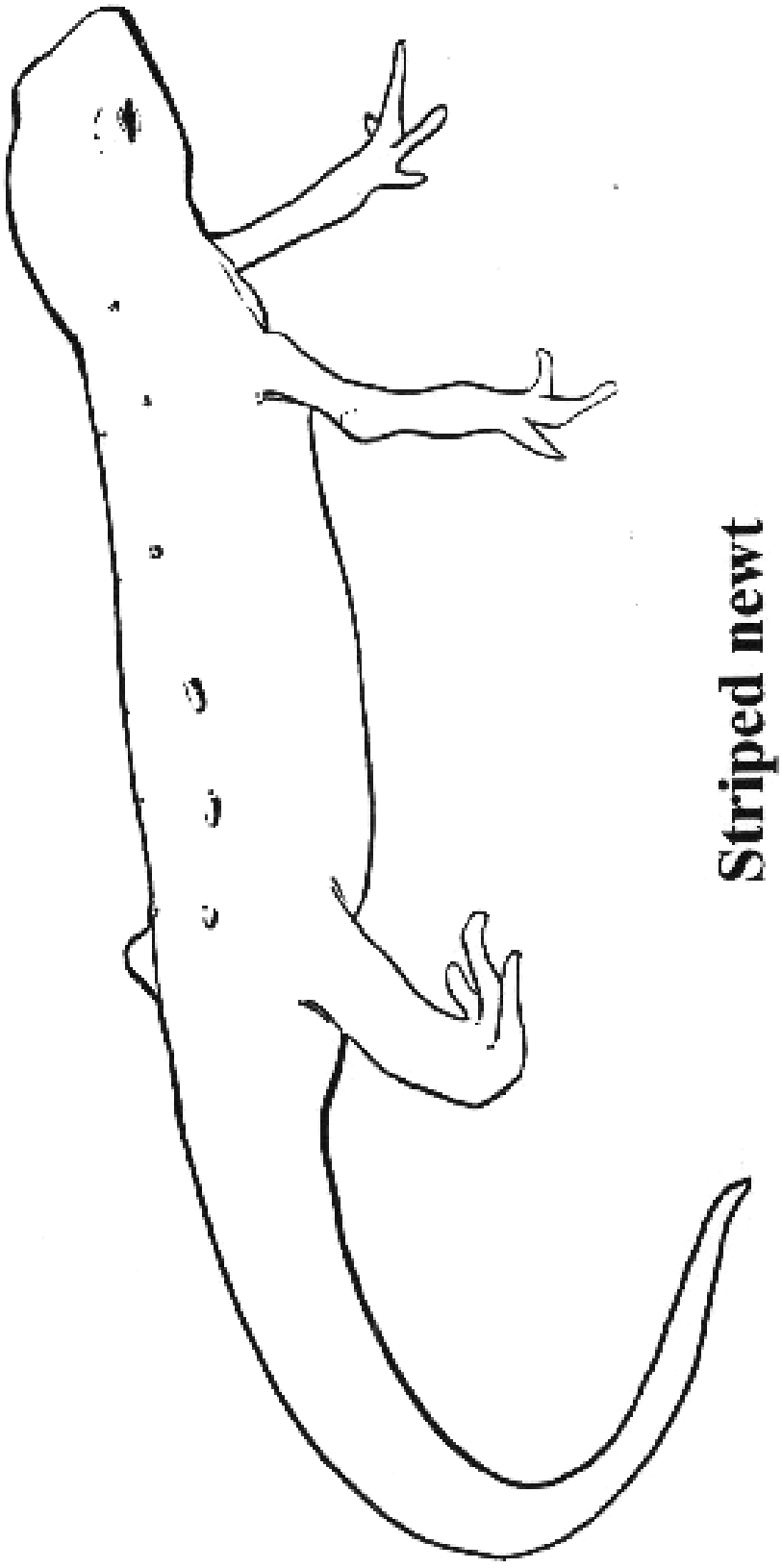


Leopard frog

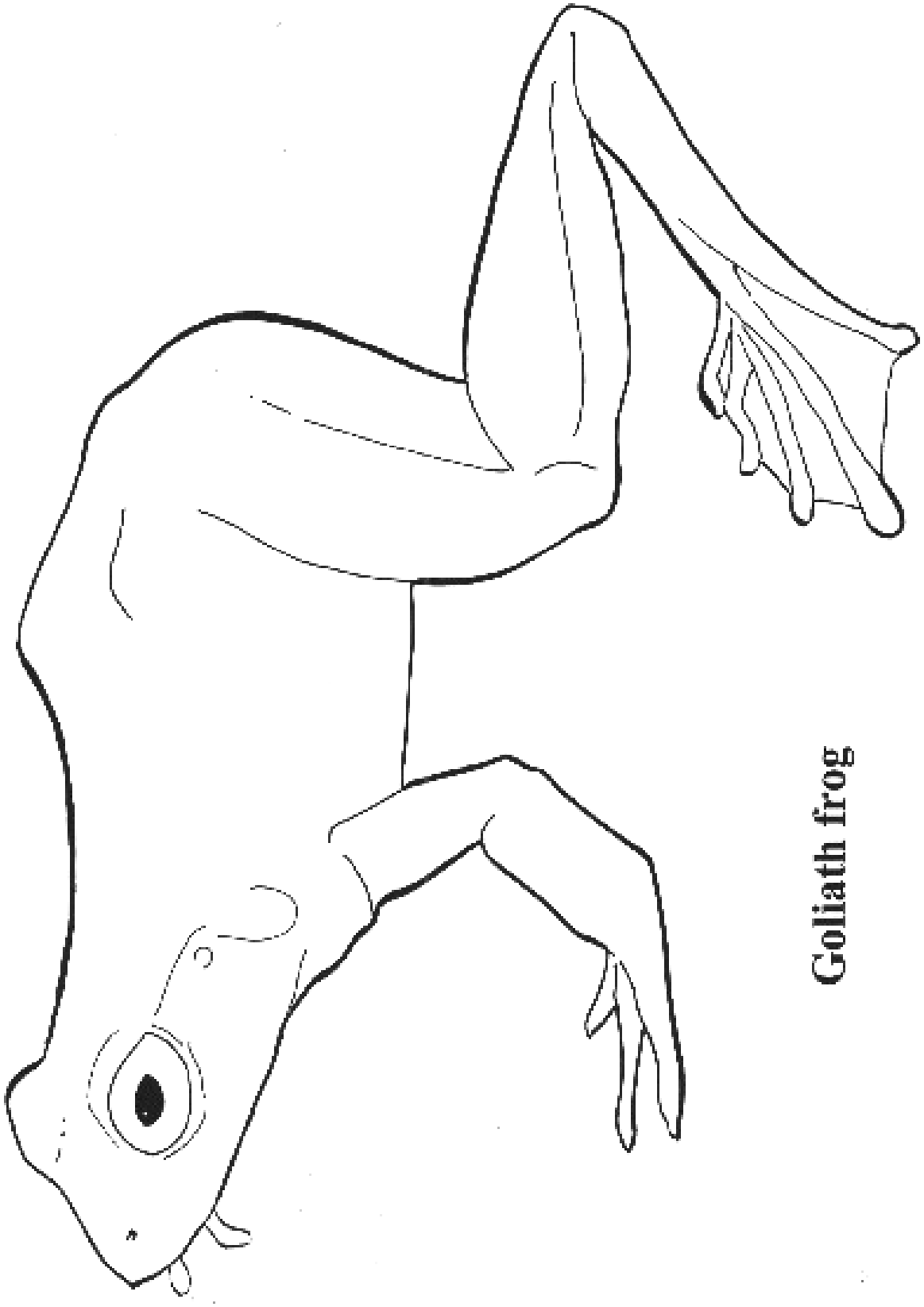
Eastern spadefoot toad

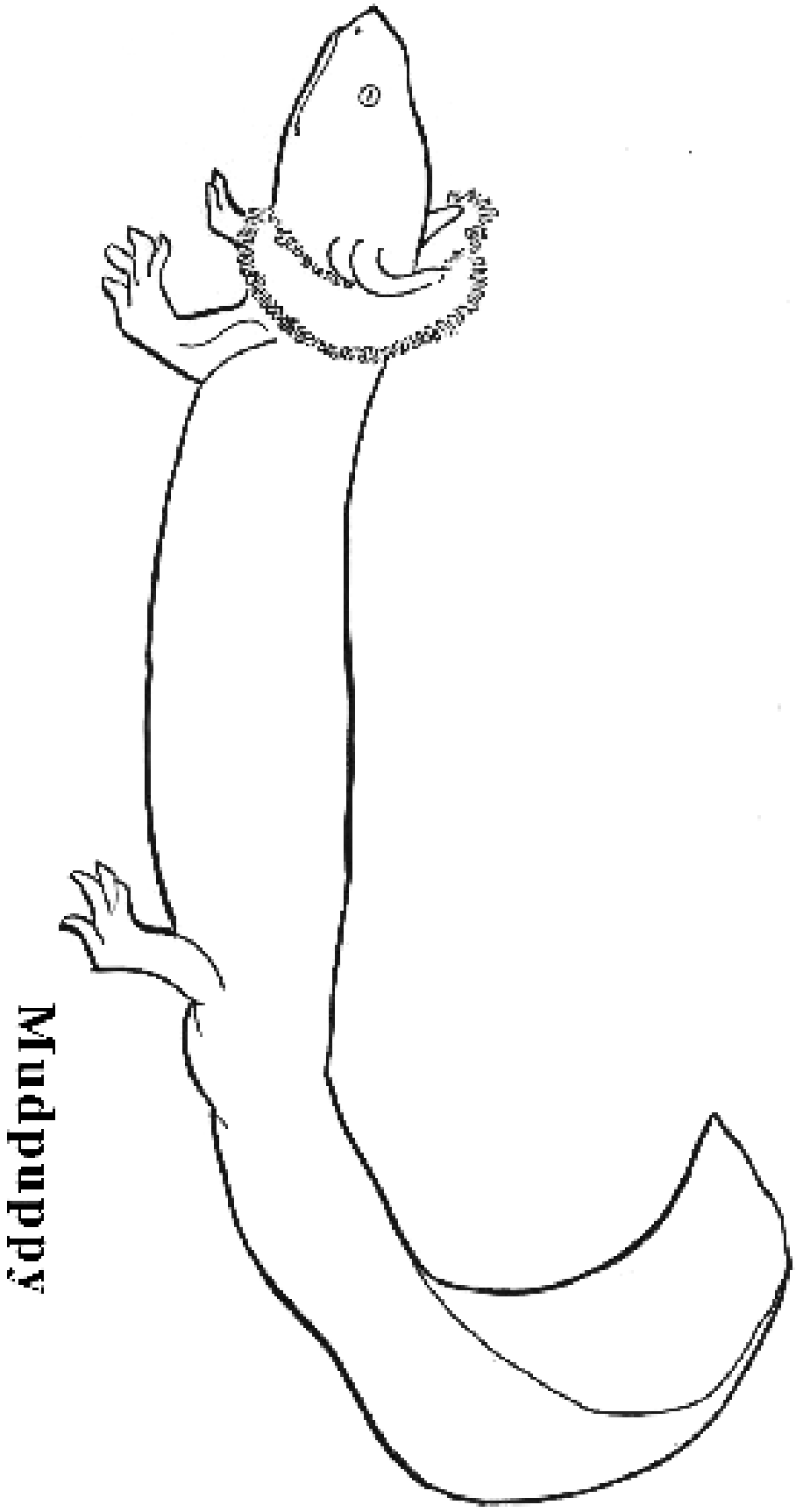


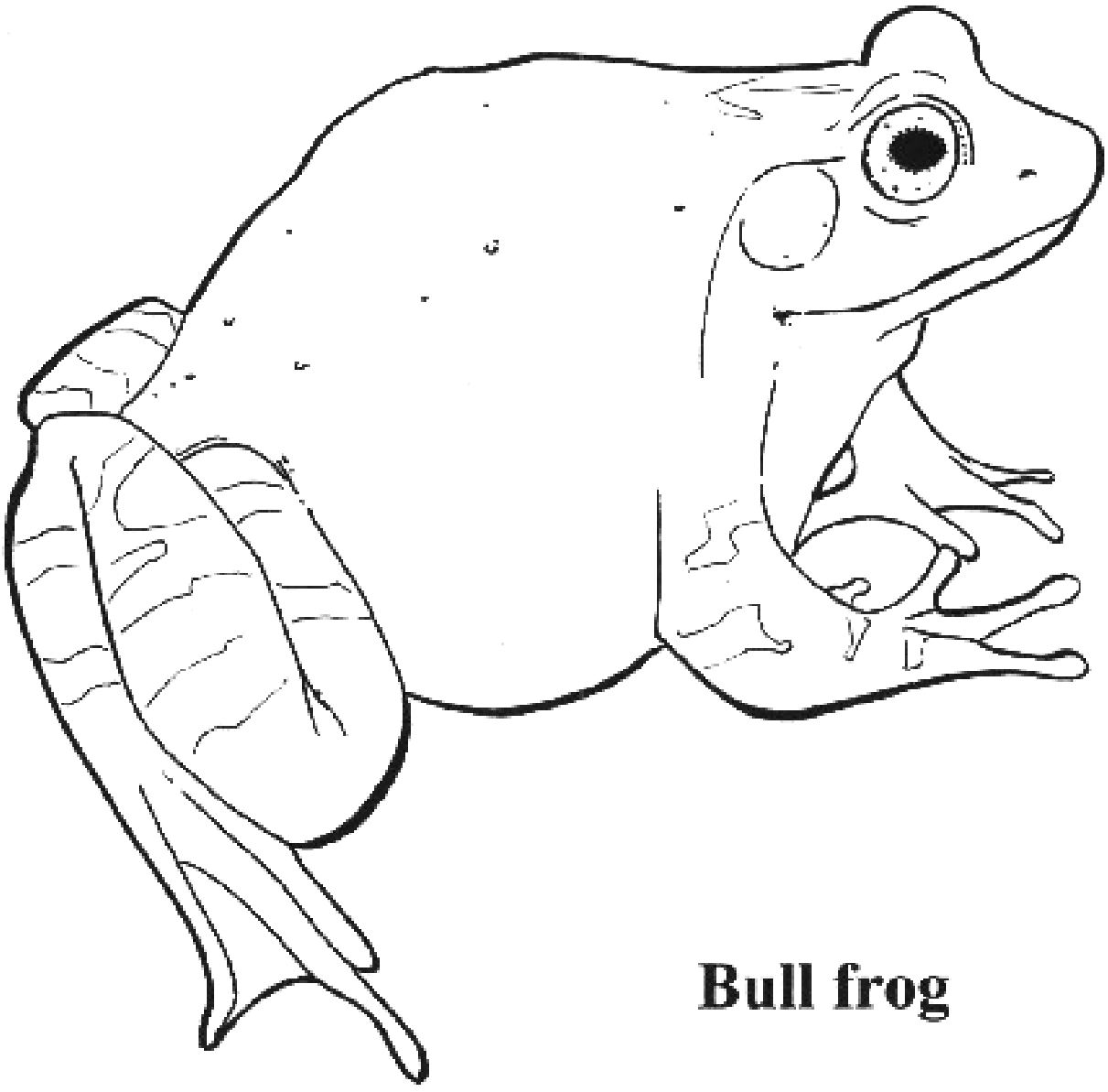

Hellbender



Striped newt

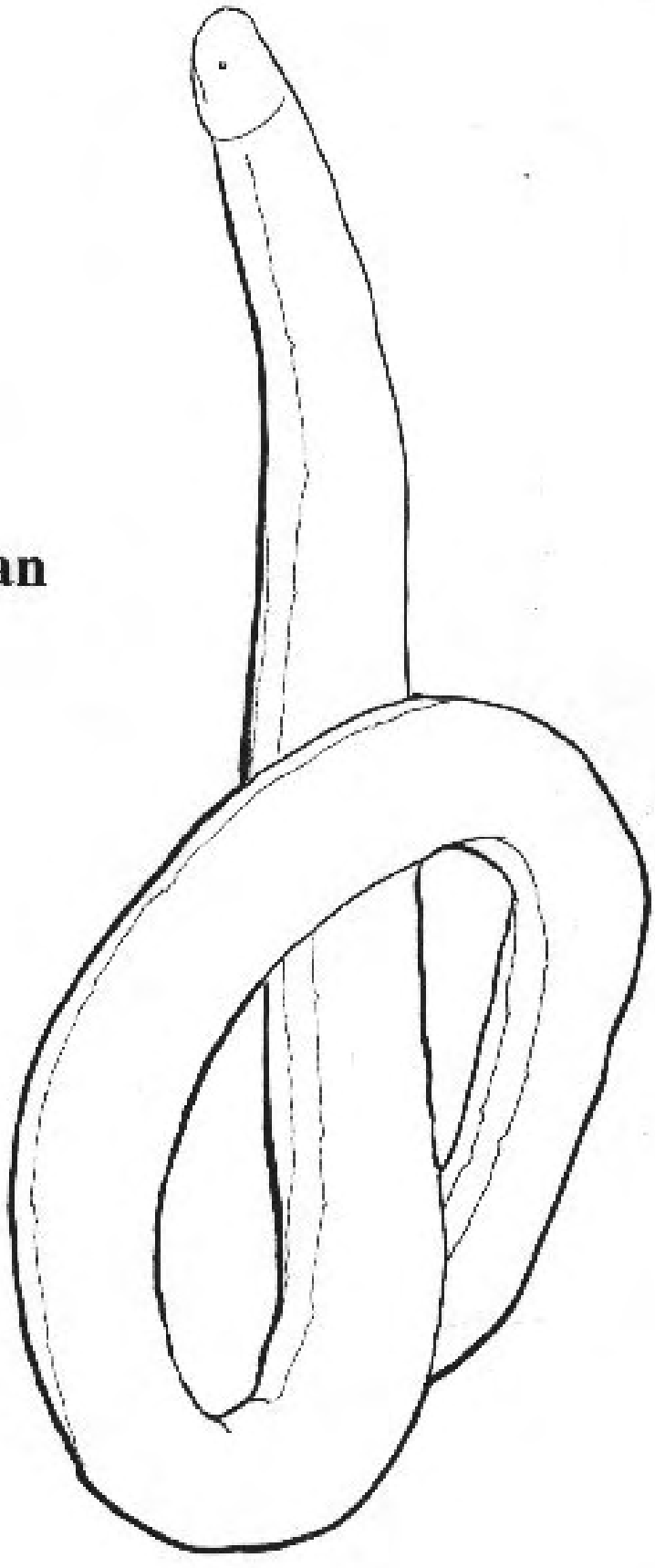

Goliath frog

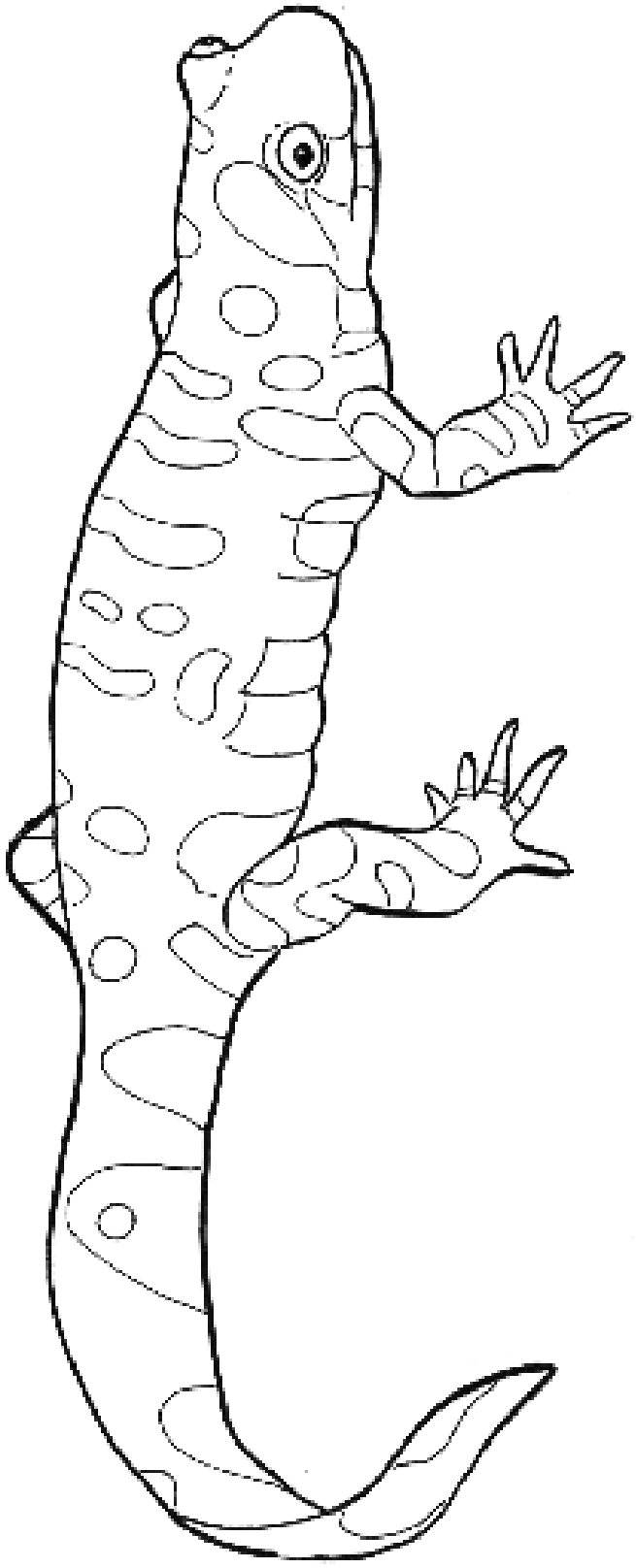




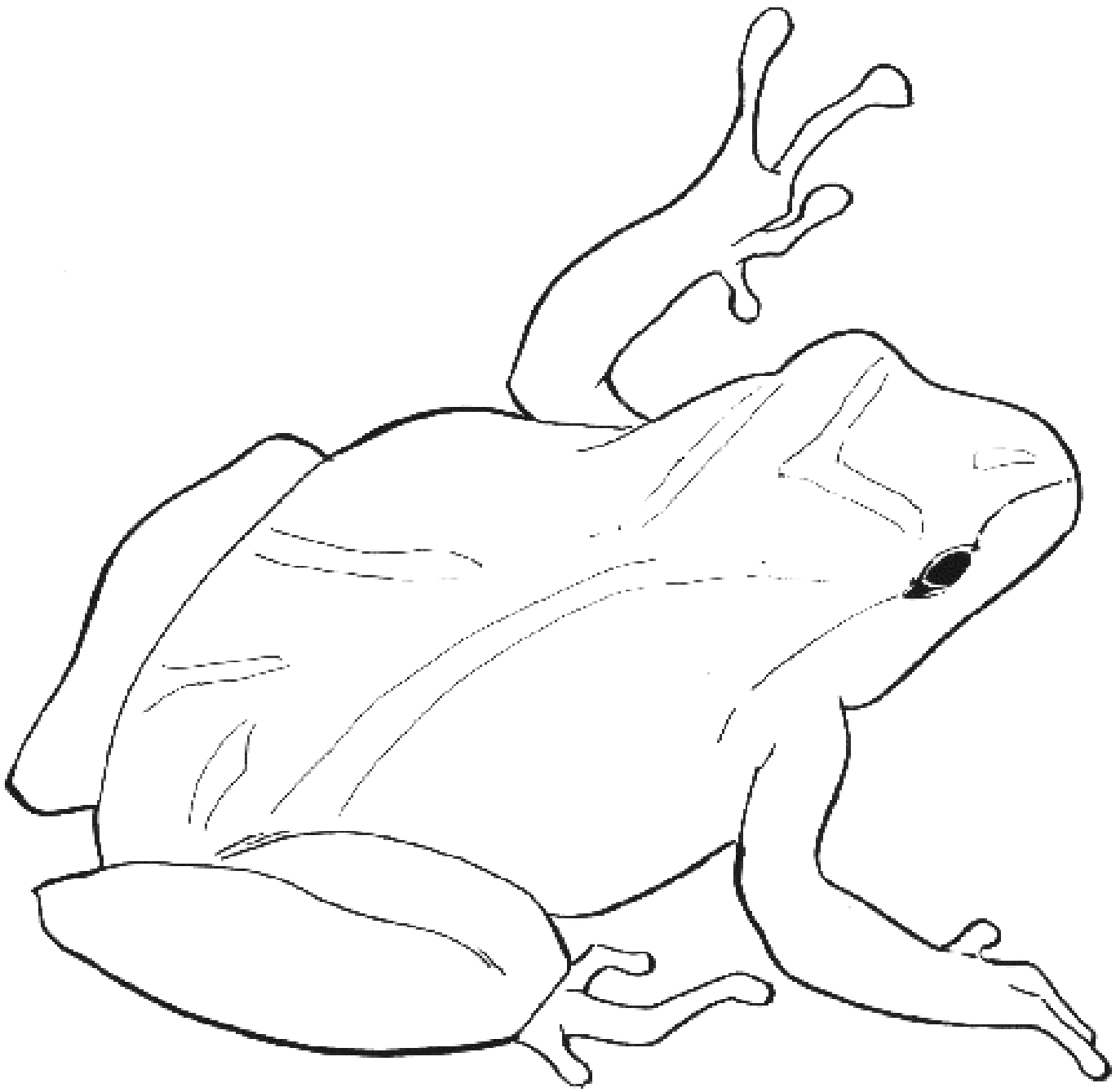
Bull frog

Caecilian

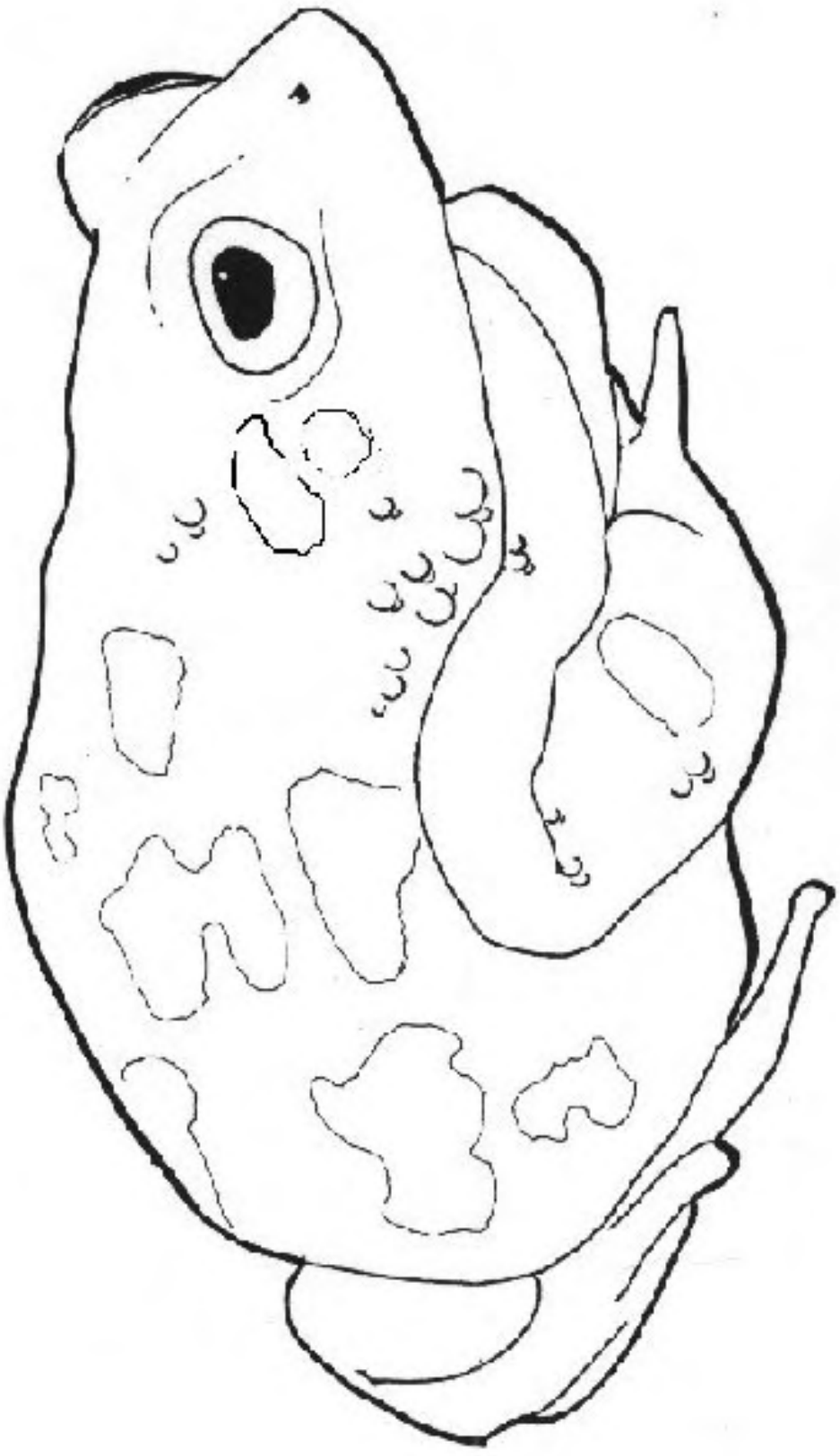




Tiger salamander



Spring peeper



Wyoming toad

From Polliwog to Frog

By making a simple puppet, your students will learn about the stages of amphibian metamorphosis from tadpole to adult.

Objective: Students will make a model of a frog undergoing metamorphosis and use this model to communicate the sequence of stages in metamorphosis. *** Slide Presentation #2- Life Part One: Eggs and Larvae can be used before or after this lesson plan, depending on the level of the students.*

Vocabulary: metamorphosis, larval, gill, lung

Background: Frog eggs are soft and jelly-coated, and they need a moist environment to keep from drying out. Most frogs lay their eggs in the water where they develop into tadpoles or polliwogs. These fishlike animals eat algae and use their strong tails to swim. Tadpoles have gills to take up oxygen that is dissolved in the water. The name tadpole comes from words meaning "toad head" while polliwog comes from words that mean "head" and "to wiggle". These names really fit an animal that looks like a big head with a tail. Over time, the tadpole sprouts back legs and later front legs. Its tail shrinks and it develops lungs for breathing air on land. Its digestive system changes also, becoming suited to eating animals instead of plants. The fully developed froglet, ready to live on land, still has lots of growing to do before it reaches adult size.

Related Subjects: visual arts, language arts

Materials:
For each student: a copy of the Polliwog-Frog puppet page, crayons and/or markers, scissors, 2 brass fasteners

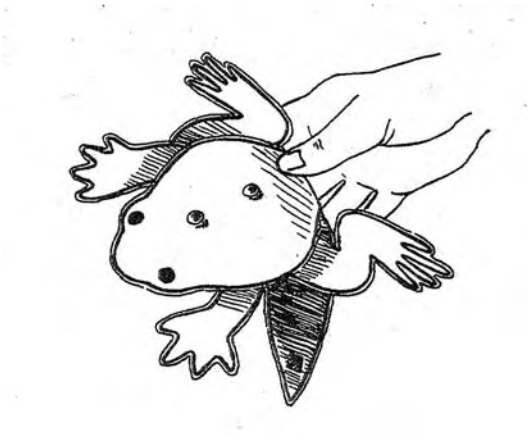
Procedures:

1. Introduce the activity with an overview of amphibian metamorphosis, based on the background discussion outlined above. Use the four stage teaching model to help illustrate the changes that occur. Define terms from the **Amphibian Alert!** vocabulary list as is appropriate for your class.
2. Tell the students that they are going to make their own models. Provide each student with a copy of the Polliwog-Frog puppet page. Ask the students to color in the body parts and cut them out.
3. Have the student push a brass fastener through circle A on the body and then up through circle A on each front leg. Have them fold down the two sides of the fastener. Then, have them attach the back legs in the same manner, matching up the circles marked B.
4. Next, have the students fold the tail under the body along the dotted line.

5. Ask the students to make their puppets into polliwogs by extending out the tail and turning the legs in so they are under the body.

6. With the aid of the puppets, review the stages of metamorphosis from egg to tadpole:

with tail → back legs appearing → tail getting smaller and front legs appearing → no tail and all four legs!



(sample puppet)

Follow along with the **Polliwog-Frog Poem**:

One day a little polliwog wished
it could be a jumping frog
(show polliwog with tail out and all legs hidden)
In the spring guess what it grew?
Back leg number one and back leg number two.
(pull out each back leg)
Its tail became short and something more…
(fold tail under body)
It grew front legs, number three and four.
(pull out front legs)
It splashed in the water.
It sat on a log.
For it had become a jumping frog!
(have the frog jump)

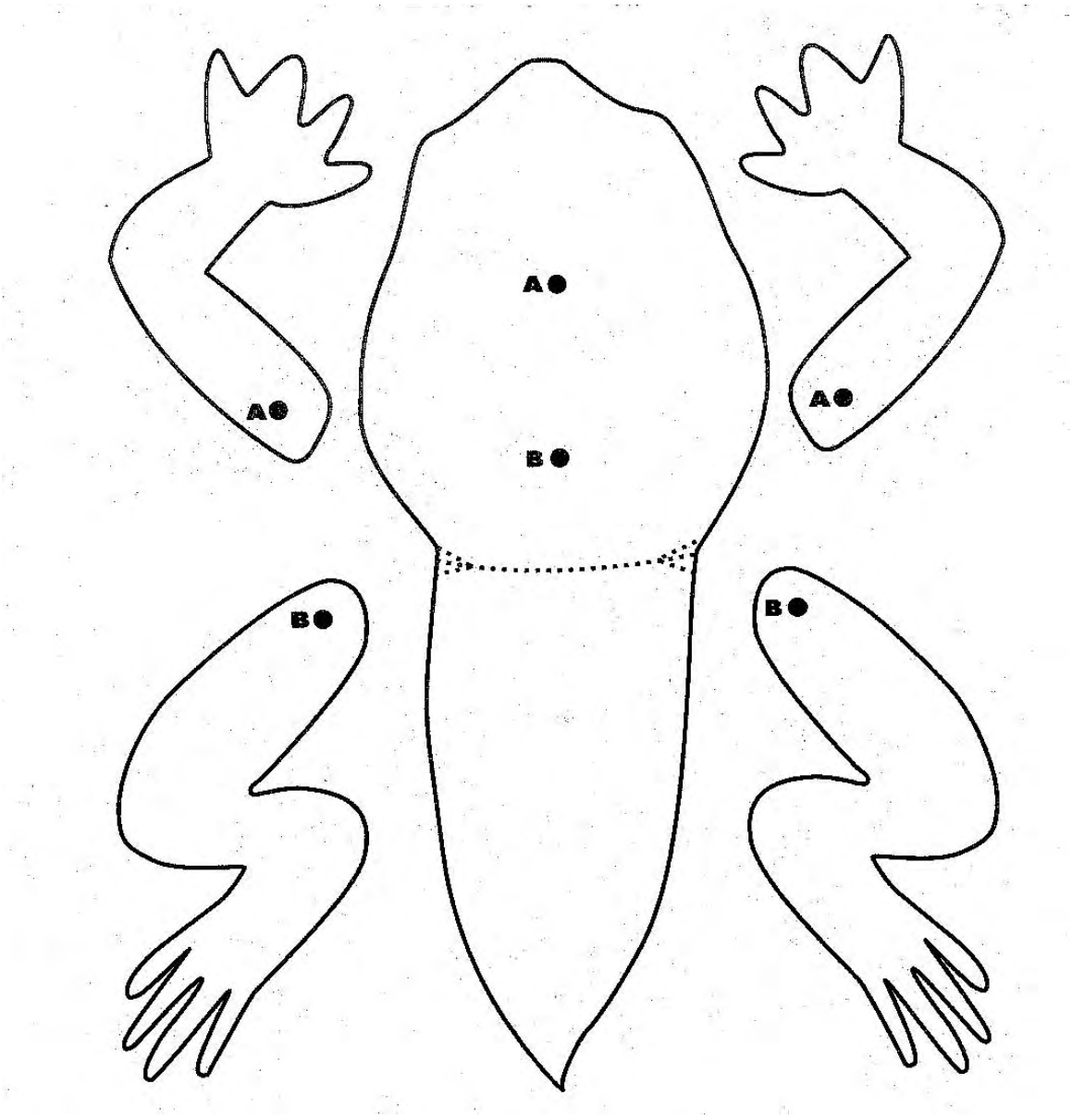
7. Close the lesson by asking questions to make sure students understand the sequence of events in frog metamorphosis.

***Activity from John G.Shedd Aquarium Frogs! curriculum*

Polliwog to Frog Puppet

To make your polliwog – frog puppet:

1. Cut out the legs and body.
2. Color each body part.
3. Fasten the legs to the body.
4. Fold along the dotted line.



***Activity from John G.Shedd Aquarium Frogs! curriculum*

Tadpole Twist

Growing from a tadpole to adult amphibian isn't always simple- your students will experience some of the challenges in this active game.

Objective: Students will learn about the development of amphibians, from egg to adult. In addition, students will realize the many hazards encountered by developing amphibians; both natural and human induced.

Vocabulary: tadpole, gills, metamorphosis

Related Subjects: science, visual arts, language arts, math

Materials: carpeted area, crumpled green paper, chalkboard or poster paper, coin, "safe zone" hula hoop or taped area, spinner or game cards. *Note: A "spinner wheel" template is enclosed in the packet. This can be laminated. A pointer can be made of cardboard or purchased at a school supply store.*

Procedures:

1. Provide a "training session" on how to look like different stages of a frog. A carpeted area will be needed:

   Stage 1: You are an egg. Tuck into a ball and sit very still.

   Stage 2: You are hatching! Slowly straighten out, belly on the floor. Put the palms of your hands up to your cheeks and wriggle your fingers as gills. Stay very still. You've just hatched and cannot move yet.

   Stage 3: Start wriggling around as you develop. Move around on your belly and look for "plants" to eat. "Plants" can be crumpled green sheets of paper that can be collected between your chin and neck. (Students grab a "plant" and then drop it and find another).

   Stage 4: Your hind legs are growing. Kick your legs as you wriggle around.

   Stage 5: Now your front legs grow. Use your arms and legs to "swim" on the carpet. (Explain to the students that even though they have taken their "gills" away from their faces, the tadpoles still have gills at this stage).

   Stage 6: Now that you have all four legs you do not need to eat any more. Swim around watching for danger. (Explain that the tadpole's tail is being resorbed into the body at this time, thus providing nutrients).

   Stage 7: You are a frog!! You hop on land and "eat" insects. (Have the students tuck their legs under to hop and make exaggerated biting movements with their mouth).

For very young children, this can be the end of the exercise. You can follow up with a discussion about how it felt to be a tadpole and a review of the life stages.

*** Activity used with permission from Sedgwick County Zoo*

The Game

The object is to complete growth (metamorphosis) in an aquatic environment and hop onto land.

1. Hand out enclosed student instructions. Encourage teams to work through the possible fates together, or for younger students, cover this as a class.
2. Designate one student to be the bass. The bass moves on all fours.
3. Provide one or more "safe zones" – areas that the bass cannot enter. Safe zones are to be used only during bass attacks.
4. Divide remaining students into teams of 5. List each team's number on a chalk board or poster paper to keep track of stages. Each team member "grows" at the same time.
5. Older students can use the hand puppets made in the "polywog to frog" activity to act out the life stages, or they can stand, using modified movements.
6. The consequences of each spin (or card) outcome are listed on the student instructions.
7. Continue playing until all teams are "dead" or "frogs". All students must continue moving and while other teams are drawing. They continue eating at all times between stages 3 and 6.

Topics for Follow Up Discussion

- How many tadpoles metamorphosed? What fraction survived?
- What changes can we make to the wheel to increase the odds for survival?
- Are all threats to tadpoles natural?
- Are all threats to tadpoles from humans?
- What if all tadpoles survive?
- Can you think of other impacts on tadpoles?
- What about metamorphosed frogs? Do they have dangers of their own, or do they share some dangers with larvae?
- What can people do to lessen impacts on frogs?
- What do we do if a wetland is in the way of a much-needed factory that will provide jobs and money for your town?
- Does helping frogs benefit anything else, or just the frogs?
- How can we convince people that frogs are important?
- Fish have been introduced into habitats where frogs and other species do not know how to avoid them. The native species have declined or even disappeared from their homes. The fish, though, provide fishing for anglers. The anglers in turn, provide money for communities through taxes, licenses, and user fees. What should be done, if anything?

Student Instructions

The first team to complete all eight stages of development is the winner. Continue playing the game though, until all have either "croaked" or made it to adulthood.

<u>Eat and Grow!</u> (grow one stage)
Life is good. Enjoy it, for things may change soon.

<u>UV is Frying Me!</u> (No growth or dead)
Some of the sun's rays are called Ultraviolet (UV). Pollution has hurt the protective ozone layer that blocks them. This UV light is bad for frog larvae. If you are still an egg, sorry - you're dead. If you are a tadpole, you don't get to develop any this round.

<u>Super Bonus Eat and Grow!</u> (grow ? stages)
If you have reached stage three, you can eat. You have 30 seconds to "eat" (grab) as many plants as you can. Each plant that you eat allows you to grow that many stages. So, if you eat 3 plants, you get to grow 3 stages. Have a great dinner.

<u>Algae Bloom</u>(grow 2 stages)
Because of farm and city waste being washed into your pond, tiny plants called algae are able to grow more than usual. This is great for tadpoles, as it provides lots of easily digested food. The extra food lets you grow 2 stages.

<u>Water's Just Right</u> (grow 2 stages)
When you go swimming, the water's sometimes too cold or too warm. But every now and then, the water's perfect. The perfect temperature lets tadpoles grow faster than normal. Enjoy your swim (and rapid growth).

<u>Shaded from UV</u> (grow one stage)
Ultraviolet is bad news for amphibians. Luckily, you've found a shady spot that protects you from the sun (like a big umbrella at the beach).

<u>Largemouth Bass Attack</u> (Swim for your life!)
Big fish love to eat tadpoles gobbling them down like candy. If you are at a stage that allows you to move quickly (stage 6 or 7), you might make it to safety (the designated safe zone). If you are a stage 1 through 5 tadpole, though, you are probably going to be a fish's dinner. If you live, you do not get to grow this round.

<u>Water Pollution</u> (no growth)
Polluted farm and city water is being washed into your pond. It contains things that hurt tadpoles, like bacteria, fertilizer, anti-freeze, and bug spray. You are so ill from this pollution; you don't get to grow at all.

<u>Housing Development</u> (stage 7 might live-no growth, stage 1-6, dead)
Your pond is being drained and filled with dirt so that houses can be built. Tadpoles can't live in dirt, so you'd better be big enough to survive on land. If you are stage 7, you get to flip a coin to see if you live (heads you're dead, tails you live). If you are stages 1-6, you didn't make it. Better luck next game.

<u>Greenhouse Gas</u> (Stage 7, flip/no growth; Stage 1-6- you're dead)
Gases released from factories and cars are helping to heat up our planet. The high temperatures have caused your pond to dry up. If you are stages 1-6, you're doomed. Better luck next game. If you are stage 7, you get to flip a coin to see if you are developed enough to live (heads you're dead, tails you live).

Stripes and Spots, Lines and Dots

Amphibian skin may be brightly patterned or dully colored. Your students will learn how colors and patterns help an amphibian survive in this simple "camouflage" game.

Objective: To identify various coloration patterns (stripes, spots, dark colors, and disruptive patterns) and understand the function of these patterns as a survival technique, serving to help animals blend into their environment.

Vocabulary: camouflage, cryptic coloration, disruptive coloration

Related Subjects: science, visual arts, language arts

Materials: Books and magazines with color pictures, two large bed sheets (one single color, one bold color pattern), numerous copies of a frog outline to trace, watch with second hand for timing game, paper and pencil for taking notes

Procedures:

1. Introduce the concept of coloration patterns to students. Ask them to discuss and give examples they can think of. Look around the room and find examples of patterns that draw attention or hide the item.

2. Divide the class into teams to explore the room/library/school yard to find patterns in nature and man-made articles. These can be patterns that help the animal or item stand out, or blend into their surroundings. Provide magazines, books to look through. Allow 10 minutes to gather data.

3. Re-gather the group to present findings to the rest of the class. What types of patterns did they find? Discuss definitions of camouflage, disruptive coloration, cryptic coloration.

4. Pose the question "How do amphibians hide in their environment?" Solicit answers and ideas from students. Keep list on board.

5. Have class prepare the pieces for the game. Reduce any of the frog outlines provided in the *Amazing Amphibians* activity to create frog outlines about 2 inches big. Trace them onto the construction paper and cut out frog shapes from a variety of colors. Some should be all one color, others should be cut out from paper with patterns and many colors. You should now have two types of frogs: half that are all single colors, half that are colored with patterns.

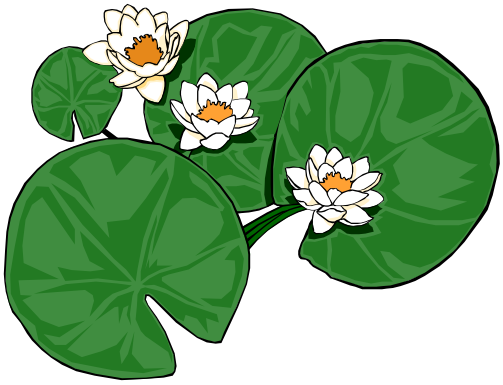
6. You are now ready to play "Stripes and Spots, Lines and Dots!" Spread two large bed sheets (or pieces of poster board) on the classroom floor or outside in the yard. Have the class turn their backs (or close eyes) while you spread the frogs over the two sheets. The colors on the frogs should match the colors on the bright pattern cloth. Class members have only 10 seconds to pick up as many frogs as they can see from where they are standing. They can only pick up one frog at a time, not scoop up a handful!

7. Discuss the results of the game. Which sheet background successfully hid which frogs? Which frogs were harder to find? When did the frogs seem to "disappear?"

8. Now, turn the class discussion back to amphibians. How could various patterns be helpful for frogs, toads, and salamanders in the wild? Discuss definitions of predator (hunting animal) and prey (animal that is hunted). Which animals might want to hide from others? What types of patterns can they think of on animals they have seen? Whether striped, spotted, or a flash of color, the patterns on an animal's body serve a vital function in nature. These body patterns are a survival technique, helping to hide predators and prey from each other. Animals that are hunters or predators want to hide from their prey for as long as possible. Prey animals also want to hide from predators or at least make it difficult to catch them quickly. When a body pattern looks like something else, it is called camouflage.

9. Play another round of the game, but this time, the brightly colored frogs are toxic. Predators that catch them may become sick or even die. The bright colors serve as a warning - as if to say, "watch out!" In nature, the most common warning colors are patterns of red, orange, yellow, and black, but dart poison frogs come in all colors. A predator may never know, so it's best to find something with duller colors. After the game, discuss the results with the students. How did they change from the first round?

10. Pose the question… "If a habitat changes drastically, how could that affect the amphibians, or any animal?" What types of habitats do amphibians live in? Scientists have seen dramatic declines in certain amphibian populations. Can the class think of some reasons? List their answers on the board, or a sheet of paper that can be kept for later activities.



*** Activity from "Zoo Clues" Series, Zoological Society of Florida, Miami Metrozoo*

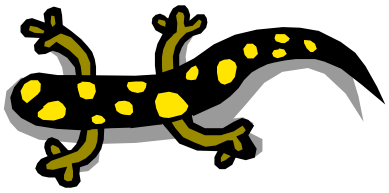
Creating Your Own "Salamander Room"

Your students will transform your classroom into a "natural habitat" fit for an amphibian in this on-going art project.

Objective: To illustrate knowledge of animal habitats and their key factors by creating an amphibian habitat in the classroom.

Vocabulary: habitat, salamander

Background: **The Salamander Room** by Anne Mazer is a wonderful story, loved by adults and children alike. In this activity you and your students will turn your classroom into an amphibian habitat! Create your own classroom mural with plants, animals, and all the important habitat features that help the residents survive and thrive. This activity should be **on-going**, allowing for students to add or change items as their knowledge increases. What better indicator of comprehension then to have a student quickly draw a new source of water then thoughtfully add it to the mural just where they think it should be? Or to have a student move a stretch of roadway because they think it is harmful to the animals? Note: This activity will take multiple class periods and involves research that can be done between sessions. Since this is primarily an art project, some students may feel hesitant about fully participating. Drawing ability is not necessary. Students should feel free to "pool their skills."



Related Subjects: science, art, literature, research skills

Materials:

- ✓ coloring book outline drawings of animals and plants * *Peterson Field Guide Coloring Books are an excellent source of accurate drawings. Or use the amphibian outlines provided with Amazing Amphibians activity*
- ✓ large sheets of butcher paper for background **These will be used for the background of trees, sky, clouds, etc.*
- ✓ Water-based craft paint
- ✓ crayons, markers
- ✓ glue or tape

Procedures:

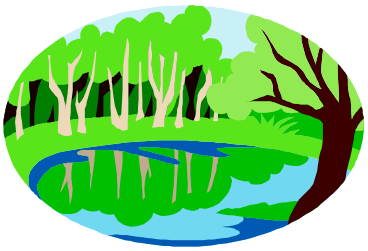
1. Read **The Salamander Room,** by Anne Mazer, which is included in your kit. Older students could participate by reading the book out loud. Discuss the story and how students felt about Brian's efforts to make his room an appropriate home for the salamander. Keep a list on the board of the "key factors" he tried to bring into his room. Review the definition of a habitat, and what every animal needs to survive.

2. Tell students that they are going to turn their classroom into an amphibian habitat too! Decide which type of habitat you want to create in the room:

❖ tropical rain forest	❖ pond	❖ swamp
❖ deciduous forest	❖ grasslands	

Ask students to gather information from the library or Internet, including photos or images that can serve as models for the background.

3. Prepare the habitat background. This is going to take lots of room, so you may want to find an open room, or move desks to the side. The students are going to draw, then paint the background (or you could do this in advance). The background does not need to be highly detailed to start. Depending on the size of your room, you may want to start with just one wall, then allow the habitat to "grow" as time and interest allows.



4. While the background is drying, the students can continue their research on the plants and animals that live in their habitat. Ask them to think about the "key factors" that Brian brought into his room to make it a good habitat. Do they have those items included in their habitat?

5. Based on the students' skills, locate illustrations or have the students draw the animals and plants to be added to the habitat. Keep a master list of all the animals and plants that can be updated as the habitat becomes richer and more diverse. Remind them that the animals and plants should be accurate - so color choice counts!

6. Keep updating your classroom habitat as your class progresses through the **Amphibian Alert!** curriculum. They may want to improve the habitat based on new knowledge they acquire, particularly after "*Frog Leg Theater*," "*The Case of the Disappearing Frogs*," and "*Where in the World?*"

7. Invite neighboring classrooms to come on a "field trip" to your new classroom habitat! The students can act as guides, helping point out some of the amazing and important factors in their habitat.

Frog Leg Theater

Your students will create plays that depict scenes from an amphibian's life in a variety of habitats.

Objective: To explore and reinforce learning and observations on animal behavior and adaptations of amphibians. * *Slide Presentation #3: Adults and Habitats can be used before or after this lesson plan, depending on the level of the students.*

Vocabulary: habitat, predator, prey

Related Subjects: science, visual arts, drama, public speaking

Materials: Amphibian Habitat descriptions, arts and crafts materials for making masks, costumes and props

Procedures:

1. The students will create short plays about the habitats that amphibians live in. Divide the class into six groups (one per habitat). Use the descriptions on the Amphibian Habitats sheets, and have the students design their own plays. If time allows, you may want to have the groups do some additional research by visiting zoo or aquarium exhibits that features these habitats or animals. The plays should include the following components:

    - a narrator
    - "star" amphibians
    - typical predators
    - typical prey
    - changes to the environment
    - weather
    - and lots of drama!

2. Give the students enough time to develop their storyline. If there is enough time, encourage them to develop props, masks, costumes or even a backdrop for their play. They may even wish to select background music that they feel evokes the habitat. Let them be as creative as they wish, as long as the portrayal is accurate.

3. Make an event of the plays! Rehearse the plays, and then invite other classes to come see them. After the plays are presented to the whole class, discuss what happened in each one. What adaptations did they chose to highlight in their predators and prey? What amphibian characteristics did they emphasize?

*If the performances are good enough, you may even choose to hold your own Oscars for "Best Predator," "Best Prey," and "Best Portrayal of a Tadpole!"

Amphibian Habitats

Tropical Rainforest

In tropical rainforests the climate varies less than in any other zone of the world. The temperature remains high and constant throughout the year. Although the sun is shining brightly above the trees, the web of branches and wide leaves only allow some of the light to penetrate to the forest floor. High up in the trees small **dart poison frogs**, all with brightly colored patterns, hop along the branches seeking small pools of water in the epiphyte plants. They lay their eggs in these pools and have even been observed moving tadpoles to another pool if the water gets too low. Predators rarely bother the brightly colored frogs that are advertising a deadly fact - eat me and you'll die! Though each species has a different pattern, the message is the same. Deadly neurotoxins are produced in the skin of the frogs. Small ants that crawl up the trees are their main food. Nearby, the **red-eyed green tree frog** sits motionless on the back of a leaf. Its thin legs are made for walking, not hopping.

Deciduous Forest

Seasons signal changes in the deciduous forest. As the temperatures rise in spring, the trees – beeches, maples, and oaks - and shrubs sprout leaves and flowers. **Cricket frogs**, **tree frogs**, and **spring peepers** begin singing trying to attract mates. The spring rains will leave pools of water that are vitally important to the growing tadpoles for these amphibians. Each type of frog has a unique call and only the males can sing. The male forces air from his lungs into his mouth, then into vocal sacs that swell his throat like a balloon. The water also brings a source of food - mosquito larvae! In the evenings, **spotted salamanders** come out from their protective cover of leaves to hunt for insects along the forest floor. Garter snakes may be on the prowl, looking for a tasty amphibian meal. At the end of the summer, temperatures begin to fall in the forest, as do the leaves. Salamanders and frogs will burrow into the mud to hibernate over the winter. When the cold of winter has passed and the warmth of spring returns, the cycle begins again.

Pond

No two ponds are alike and they are ever changing. The shallow shores permit cattails, pondweed, and water-loving grasses to push out into the water. The relatively uniform temperature of the water creates a haven for plants and animals alike. Muskrats, herons, and raccoons find food along these shores. In the spring, these ponds are alive with the noisy calls of **northern cricket frogs** and **leopard frogs** trying to attract a mate. Their calls are different enough for female frogs to know the difference. The warm water near the shore is an ideal nursery for developing tadpoles that will feed on microscopic animals in the water. **Spring peepers** often call from shrubs and tree branches that overhang the water's edge with a high pitched ascending whistle. In late fall the peepers hibernate under logs and loose bark, while the cricket frogs will burrow in the mud to wait out the impending cold of winter.

Grassland

Rolling hills and waving grasses as far as the eye can see - not exactly where you'd expect to find water-loving amphibians. Grasslands traditionally receive less than 20 inches of rain per year. Some toads have adapted to a drier lifestyle, such as the **western** and **plains spadefoot toads**. These toads dig burrows into the loose dirt to hide in during the day. At night they come out to feed on insects and other small animals. Keep an eye out for hognose snakes that would have you for dinner. After a rainstorm, spadefoots can be found congregating around pools of water, trying to find mates with which to lay eggs. The tadpoles must develop quickly before the pool evaporates in the next few weeks. The rains may also bring out the striped chorus frog, who creates a lively call to attract mates. The rough-skinned **red-spotted toad** may seek shelter in loose rocks to avoid the harsh sunlight of the day.

Swamp

The swamps in the southeastern U.S. feature towering bald cypress trees, draped with Spanish moss. Other plants such as bulrushes, and skunk cabbage can be found here in anywhere from a few inches to several feet of water. The air is hot and humid in the summer heat. Along the edge of the slow-moving waters alligators and turtles bask in the sunlight. Hidden in the vegetation, the **bullfrogs** wait patiently for their next meal. Bullfrogs have been known to eat insects, crayfish, small fish, and other frogs. The deep voice of the bullfrog can be heard almost a quarter of a mile away as they call their distinctive "jug'o rum." Bullfrogs, like other frogs, have their eyes placed high on their head, which allows them to barely break the surface of the water to look around for food or predators like otters or racoons. At the first sign of danger, the frog disappears underwater. **Green tree frogs** are barely visible along the branches near the swamp, while **southern leopard frogs** float motionless near the surface of the water.

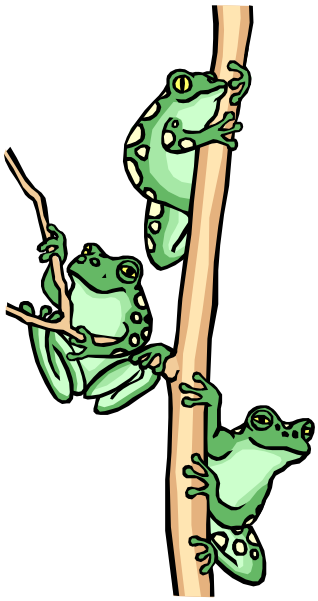
Soak it Up: Amphibian Skin

When is an egg like an amphibians skin? Your students will discover in this activity that demonstrates the concepts of permeability.

Objective: To understand the concept of permeability and how different body coverings can effect how much of and how fast a chemical moves into an animal's body.

Vocabulary: permeable, toxic

Background:



Amphibians have unique body coverings. Along with being moist, amphibian skin is also thinner than most vertebrates which allows for high oxygen exchange with blood vessels close to the surface. Their unique skin allows them to do things that birds, mammals, or reptiles could never do. This may also be one of the factors that has contributed to declining populations and extinctions.

In particular, it is the permeable nature of amphibian skin that may put them at risk. Permeability relates to how easily molecules can pass back and forth from the environment into the animal or from the animal into the environment. Typically, the larger a molecule is, the more difficult it is to enter the animal through its skin. Amphibian skin is much more permeable compared to other vertebrates.

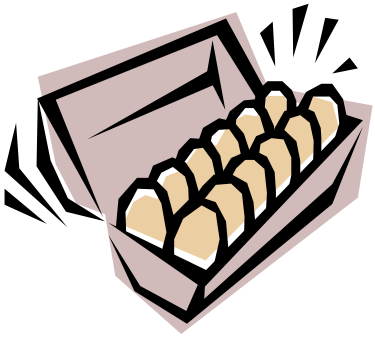
Many amphibians living in moist habitats can actually absorb water from the soil around them. Toads can do this by pressing their bellies against the moist ground.

Many amphibians use their skin to breathe. Oxygen dissolves into the liquid on the surface of the skin and then is picked up by blood moving close to the surface. Frogs hibernating at the bottom of ponds can get all the oxygen they need by using their skin as a giant gill. Some salamanders are so good at breathing with their skin that they do not have lungs.

The same adaptations that allow water and oxygen to move through an amphibian's skin and into its bloodstream also make it easy for harmful chemicals to move into the amphibian's body. Toxic substances present in fog or rainwater may kill frogs, but reptiles, with their scaly, less permeable covering, are not harmed.

Related Subjects: science, mathematics

Materials: Hard-boiled eggs, food coloring (dark colors), clear cups, water



Procedures:
Discuss the function of skin and the differences between amphibian, reptile, and mammal skin. This experiment will illustrate what "permeable" skin is.

1. Take two hard-boiled eggs, one peeled, one not.
2. Measure the circumferences of both eggs first.
3. Put both eggs into 2 cups of water that has 20 drops of red or orange food coloring added.
4. After 24 hours measure circumference of each.
5. Peel the egg that still has a shell, then cut both of them in half. Measure how far into the egg the food coloring has moved.

The shell of an egg acts like a mammal's or reptile's skin. It is less permeable, so acts as a barrier to the water and food coloring. The water did not penetrate into the shelled egg as far as it did into the unshelled egg.

The peeled egg, with only a thin membrane surrounding it, absorbed more water. The food coloring traveled further into the egg. The absorbed water made the egg swell, increasing the circumference.

Discussion Starters:

1. What animal do you think would be more affected by water pollution, a frog or a lizard? Why?

2. What does this experiment tell you about the susceptibility of the unshelled amphibian egg to water pollution?

*** Adapted from and used with permission from A Thousand Friends of Frogs, Center for Global Environmental Education,, Hamline University Graduate School.*

Postcards from the Pond

Your students will put their research and creative writing skills to the test as they tell of their amphibian lives through postcards and ad campaigns.

Objective: To familiarize students with typical amphibians and increase awareness of some of the world's lesser known or misunderstood animal species. ***Slide Presentation #3- Adults and Habitats can be used before or after this lesson plan, depending on the level of the students.*

Related Subjects: science, creative writing, research.

Materials: research and reference books, arts and crafts supplies, paper and pencil for notes, postcards or paper for writing letters

Procedures:

1. This activity has two parts – first: the students research particular amphibians and write a postcard as if they were that particular animal. Second, they will work as teams to develop an ad campaign to increase awareness and understanding of amphibians around the world.

2. Ask the students to choose an amphibian to research. Remind them to pick one that is fairly common, or found locally so they are able to find some information about this particular animal. Be aware that some animals may be harder to find information about. Working with the school resource librarian, you may want to pre-select some species. Using reference books from your school Media Center, allow the students some time to research that animal and its habitat.

3. Now the students are going to write a "postcard from the pond" as if they were that animal. Students should write a postcard to a friend who lives in another habitat, describing what life is like for him/her in that habitat. They should describe their home, lifestyle, social group, other animals they might encounter, favorite foods, etc. Example:

"Dear Mr. Tree frog,

Hope life in the trees is going well for you. My days in the marsh are filled with trying to lay low until nightfall, when I can really make some noise! Only problem is that sometimes all my croaking gives my location away, so I keep my eyes open for incoming flashlights. I'm not nearly as good at climbing as you are, so I catch my food right out of the water, or as it flies by. (flies, get it!)

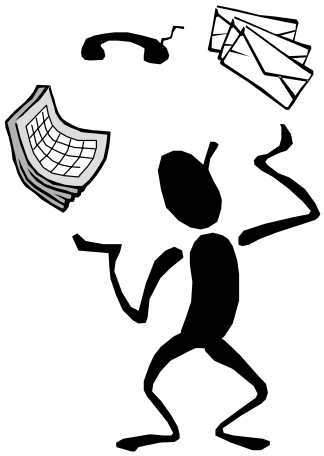
Gotta Hop, Mr. Bullfrog"

Exchange the postcards and read them out loud. Discuss the students' impressions of their amphibians. Be sure to reinforce the vocabulary words provided.

4. Despite their beneficial role in nature, many animals, including amphibians, are often misunderstood. For the second part of this activity, the students will research certain species and develop an "ad campaign" to help the public understand them better. Divide the class into small teams. Either assign each group an amphibian to research, or allow them to choose from the ones they have been studying. They need to learn as much as they can about the animal: appearance, diet, habitat, social grouping, communication, special abilities, and history, even myths about them! Many of these animals have been the subject of fantastic stories that created great misunderstandings about them.

5. Once their research has been completed, the students need to work as a creative team to develop a campaign to help these amphibians improve its image. They know the facts now and need to help spread the truth! Encourage them to create posters, flyers, songs, poetry, even TV commercials. They may want to study other ad campaigns to see what is effective.

6. Have the student teams present their campaigns to the class. Who was the most convincing and what "tools" did they use? Have some fun!

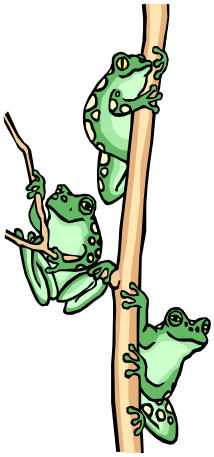


Caller ID: The Frog Mating Game

Frogs are a very vocal group of amphibians- your students will learn how frogs find each other and how scientists use these calls to study populations.

Objective: To have students understand a variety of calls, and simulate a frog chorus. Students will then find "mates" based on calls used.

Vocabulary: diurnal, nocturnal



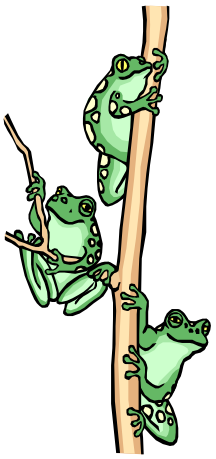
Background: This is a sensory experience that recreates the sounds of a pond at night. It can serve first as an introduction to frog communication and, second, as a demonstration of the calling system used by frogs during breeding season. Each species of frog has a distinctive mating call that allows similar frogs to find each other.

Procedures:

1. Ask your students if they have ever heard the frogs calling on a warm spring night. You may wish to play some sample calls from the *Amphibian Alert!/ Frog Songs Audiocassette* that is included with your curriculum. (You will use this tape in more detail at the end of this activity). Explain that you are going to re-create this experience in the classroom.
2. Divide the group into four teams. Each team represents a different species of frog. Have each team practice their call.

Team 1 - Spring Peepers: “peep”
Team 2 - Wood Frog: “ quack”
Team 3 - Bull Frog: “jug-o-rum”
Team 4 - American Toad: “thrillllll”

3. Have the teams start their calls one at a time. Add additional teams until all four are singing! Wow! What a loud pond!



4. Ask the class “How would you be able to find an individual frog based on all those calls?” Explain that each species has a distinctive call, to help males and females find each other. During the spring mating season male frogs call to attract females.
5. Have the class pair up for the next activity. Ask each pair to create their own unique sound pattern, for example “snap, snap, clap.” Encourage them to use other parts of their bodies besides their mouths.
6. After each pair has demonstrated its sound pattern, explain that each pair represents a different species of frog and they need to use their sound pattern to find each other.

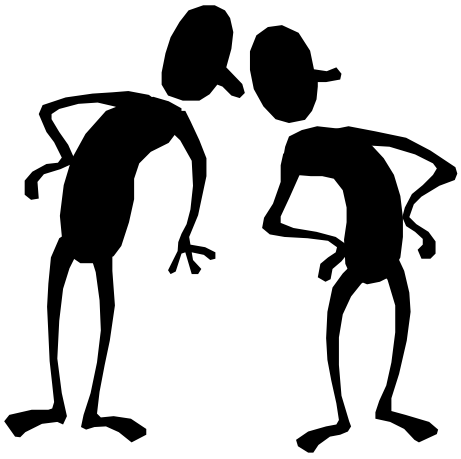
7. Move the class to a large, unobstructed space (a classroom without desks, or the all purpose room). Depending on the size of your group, have 6-8 pairs put on blindfolds or close their eyes to become the "frogs". The remaining students will serve as monitors to make sure the "frogs" don't run into walls or each other. The monitors should take the frogs by the elbow to guide them away from hazards.

8. Ask all the students to be quiet. The monitors should move their frogs away from each other and spin them once or twice. At your signal, the frogs should start making their sound patterns and walking around the room. Continue play until all the pairs have found each other. The players need to be quiet until the end of the game. Now, switch pairs so the monitors become the "frogs." Play the game until all the students have been calling frogs.

9. Discuss the students' impressions of how difficult the activity was. Even though the natural tendency is to laugh alot, the task of finding each other is harder than they may think.

10. Listen to some real frog calls, provided on the *Amphibian Alert! Frog Songs Audiocassette* that is included with your curriculum. The tape has a guide that tells which frog is calling. Check the following script to see if any of these frogs can be found in your area. Do any of the calls seem familiar? If your students are really talented, see how well they can imitate the calls (but not all at once)!

11. Have 2 students leave the room. These will be the "scientists" monitoring the frog population. Have the class decide how many frogs of each species will be calling. Bring the blind-folded scientists return to the room. Ask them to estimate how many frogs of each species is calling. Change the roles and number of frogs calling and conduct several trials. Discuss the challenge of this task. What methods did the "scientists" use to estimate populations?



***** adapted from "Spring Chorus" activity from Roger Williams Park Zoo***

Amphibian Alert! Frog Songs Audiocassette

Introduction Script:

Birds use songs to find mates. So do frogs. They find mates by listening for the right sound. Each kind of frog has its own unique song. While most birds sing during the day, most frogs call at night. During the night, frogs are protected from the sun and can hide from danger. So, they must be very good at finding each other by sound. Listen now to some different frog calls. What does each call remind you of? Can you make that sound?

Scientists listen to frog calls too. By listening to frog calls, they know how frog populations are doing. How many kinds of frogs can you hear in a diverse chorus? Scientists get worried when a diverse chorus becomes one peepy frog. An important part of a scientist's work is determining how many frogs are calling now compared to previous years.

*(*order of amphibian calls)*

1. Plains spadefoot toads (Individual then chorus)
2. Woodhouse toads (with plains leopard frogs chuckling)
3. Cricket frogs
4. Eastern Gray Treefrogs
5. Crawfish frogs
6. Plains leopard frogs
7. Bullfrogs (with cricket frogs clacking)
8. Eastern narrowmouth toads

Amphibian Alert! Frog Songs Audiocassette

Recordings by: **Keith Coleman**
Narration by: **Brad Batdorf**

Back to the Pond- Habitat Fragmentation

In this large-scale simulations game, your students will learn first-hand the challenges that amphibians face on a daily basis as their habitats are fragmented.

Objective: Students will look at the challenges amphibians face when their habitat is fragmented, particularly the challenge of migration.

Vocabulary: habitat fragmentation, habitat degradation, migration

Background: All species need adequate space for day-to-day living, feeding, and migration. Most species are sensitive to changes in their habitat brought on by human activity. Habitat fragmentation occurs when large areas of woods, grasslands, riversides, or other habitats become separated into smaller pieces, usually from human activity such as building roads, cutting large blocks of trees, building homes, etc. Without corridors, these "islands" of animals become isolated from each other. This reduces their chances to choose mates and breed and can ultimately cause extinctions.

When you think of habitat destruction, you may picture mass extinction far away places. However, habitat fragmentation is occurring in our own backyard. Although scientists are researching causes of amphibian declines in seemingly undisturbed habitats, the cause for most amphibian (and other animals) declines is easily identified - habitat degradation and fragmentation.

Related Subjects: physical education, geography, math

Materials: newspaper, newsprint sheets, or construction paper, markers or crayons, large playground balls (soccer, volley, basketball, etc.)

Procedures: This game can be done outside in the schoolyard (if its not too breezy!) or inside in a large room.

1. Divide class into two teams and explain their roles: the "amphibians" and the "cars." The goal of the game is for the "amphibians" to travel from water to land then back to water without being hit by a passing "car." The "cars" are represented by a ball that is gently rolled down the roads at a safe speed. "Amphibians" have to walk heel-to-toe slowly across their habitat or the imaginary roads. "Cars" will roll a ball gently back and forth in straight lines down the road. "Amphibians" are not allowed to leap out of the way, but must keep going across. They can stop, or back up, but not leap.

2. Create the habitat using large pieces of newspaper, newsprint or construction paper. Half of the sheets will become "water", half of which become "land." You can mark them with blue for water and green for land. If your class is feeling extra creative, they

can draw these features on the paper. During the four rounds of the game various pieces of paper will be removed and replaced with roadways and stores.

3. The game will be played for 4 rounds, following the grids as outlined. Each round creates a more fragmented habitat in which the "amphibians" can live. The rounds should last about 3 minutes. Remember, the "amphibians" must move from water to land, then back to water without getting hit. The "cars" can only roll in a straight line once an area has been cleared. As the game begins, the "cars" can only roll on the outside of the habitat. The students on the cars team should pair up, so they are rolling the ball from one partner to the other. Review the rules:
   - ✓ Two "amphibians" cannot occupy the same space.
   - ✓ If an "amphibian" doesn't move during the round, they are out.
   - ✓ "Cars" cannot aim for "amphibians" in their habitats. If they do, they are out.
   - ✓ The game is over at the end of the 4th round. How many "amphibians" are left?

Opening set -up for game:

W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W
W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W
W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W
W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W

Round One - add a few roads:

W		W	L	W		W	L
L		L	W	L		L	W
W		W	L	W		W	L
W		W	L	W		W	L
L		L	W	L		L	W
W		W	L	W		W	L
L		L	W	L		L	W

Round Two - widen to split-lane highways:

W			L			W	L
L			W			L	W
W			L			W	L
L			W			L	W
W			L			W	L
L			W			L	W

Round Three - add a couple of stores:

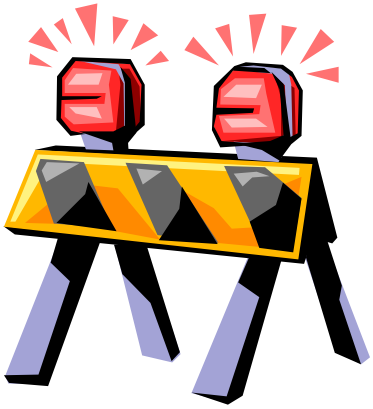
			L				
			W			L	W
			L			W	L
L			W			L	W
W			L				
L			W				

Round Four - the stores need parking lots and off-ramps from the highway:

			W			L	
			L			W	L
W			L				
L			W				

4. At the end of the game, discuss the results with students. How many "amphibians" were left at the end of the game? How did they manage to survive? Can they think of ways to change the results? How could the roads, stores, and ramps have been built differently? How can scientists determine "how much habitat is enough?" for the amphibians and other animals? What problems might automobile noises pose for frogs that rely on calling to find mates?

5. If your students find this a challenging problem and wish to pursue it further, they may wish to become involved in marking nearby roadways to let drivers know they are entering "amphibian habitat."



The Case of the Disappearing Frogs

Your students will explore a "murder mystery" about disappearing amphibians and find that the list of "suspects" is extensive.

Objective: Students will examine the variety of potential causes for current amphibian declines worldwide.

Vocabulary: habitat, toxin, bio-indicator

Background:
She walked into my office late one day and brought trouble with her. The first thing I noticed were her legs. They were long. Come to think of it they were green, too, with funny little webbed feet. She looked at me with those big bulging eyes and I knew she needed help. I took her arm and hopped her over to a chair. Her skin was moist. She told me her offspring were missing . . . all three thousand of them.

Welcome to "The Case of the Disappearing Frogs" created by the Oregon Coast Aquarium! Visit the website, http://www.aquarium.org/education/spotlight/disappearingfrogs/index.htm to obtain a full text copy version of the complete saga. The story has multiple chapters that can be accessed from the menu page. Depending on the level of your students, this activity can be done as a series of individual or group reading assignments with follow up group discussion as you and your students investigate:

- The Victims
- The Crime
- The Suspects
- The Interrogation
- The Solution
- The Assignment

"The Case of the Disappearing Frogs" brings together what your students have learned throughout **Amphibian Alert!** about amphibians characteristics and lifecycles, their habitats and diets, and potential threats to their survival. The mystery is not neatly wrapped up at the end, because scientists believe there are multiple problems affecting amphibian populations… there is no single "criminal" in this case. After your students discover and discuss the issues, they can test their knowledge by taking "The Interrogation." Additional classroom activities are included in "The Assignment."

Related Subjects: research, problem-solving, language arts

Materials: access to Internet to obtain full copy of "The Case of the Disappearing Frogs"

Extension Activity:

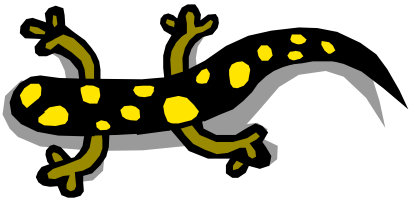
At various phases in "The Case of the Disappearing Frogs", the students should return to their classroom habitat mural, they created after reading **The Salamander Room**. Ask the students to make any changes they believe would have occurred to the habitat and animals, based on what they are discovering in "The Case of the Disappearing Frogs." How have "The Suspects" affected the habitats they created such as tropical rain forest, deciduous forest, pond, grassland, and swamp? Remind them that their original classroom habitat murals did not include human impact of the area. What do they need to add or subtract from their original picture?

**Activity used with permission from the Education Department of the Oregon Coast Aquarium*

Lost Your Marbled Salamanders Board Game

Your students will experience the challenges faced by a North American amphibian species in this simple board game. The game can be adapted to other local amphibian species.

Objective: Students will understand that amphibian populations are threatened by a number of different factors.



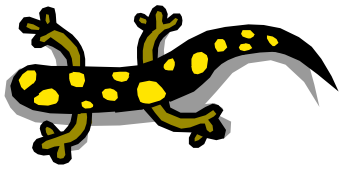
Vocabulary: habitat, disturbance, human impact

Background:
Marbled Salamanders are small salamanders that spend most of the year safely hidden in an underground burrow in the moist forests of the southeastern United States. Each year, before the onset of fall rains, these salamanders emerge from their burrows and travel to temporary pools to breed. A Fact Sheet is included with this lesson plan, which can be copied and shared with students. The Marbled Salamander Fact Sheet provides information on habitat preferences, diet, behaviors, and current scientific research on this species.

Amphibian populations may be in trouble because of one human activity or because of the additive effect of a number of different human-related activities. Playing this board game will allow students to explore this issue as they take on the challenges that a marbled salamander faces as it moves from its home in the woods to a breeding pool. This game can be used as a summary of other **Amphibian Alert!** activities or an introduction to amphibian declines.

Related Subjects: math, language arts

Materials: game board, game cards, game pieces



Please note: *This game is best played with 2-4 players, so this is not a whole class activity. The game should be explained to the entire class, then be available for small groups to play as the schedule allows.*

Rules of the "Lost Your Marbled Salamanders" Board Game are similar to "Candy Land" - each player draws a card and moves forward as directed by the card. Play continues until one player reaches the finish line. Two to four players can play at once. If all the cards are used before there is a winner, shuffle the cards and continue play. Enjoy the game!

Extension Activity:
Once your students have become familiar with this game, challenge them to research and write a version based on a local amphibian. Are the problems different for other regions of the United States?

**Activity used with permission from the Education Department of the Tennessee Aquarium*

Marbled Salamander Fact Sheet

The marbled salamander *(Ambystoma opacum)*, also called the banded salamander, is a member of the mole salamander family. It gets its name from the white or silver bands that cover the black bodies of adult salamanders.

Habitat

The marbled salamander is typically found in floodplains and low-lying fertile areas dominated by hardwood trees. The animal remains underground during dry weather. In the fall it leaves the woods and migrates to a nearby pond, where it mates, and females lay eggs.

Range

Marbled salamanders occur from southern New England to northern Florida and west to southern Illinois, southeastern Oklahoma and eastern Texas. Disjunct populations are found near the southern perimeters of Lakes Erie and Michigan, as well as in southwestern Missouri and along the northern border between Ohio and Indiana.

Breeding

Although other salamander species in the mole salamander family breed in water, the marbled salamander does not. It migrates to a pond before autumn rains begin. There, the animal begins to court and mate. Each female lays her clutch of 30 to 100 eggs in a dry depression, and the embryos begin to develop. A female usually stays with her eggs until autumn rains begin to fill the pond. When the nest sites become flooded, the eggs hatch within a few hours or days.

Feeding

Aquatic salamander larvae feed almost continuously on zooplankton, tiny near-microscopic aquatic animals. They feed in the water at night and under leaf litter on the bottom of the pond during the day. As they grow, they eat larger prey, such as small insects, tadpoles, and the larvae of other kinds of salamanders. After four to six months, the larvae have grown enough to lose their gills (or metamorphose), and leave the pond to live on land.

Adults remain dormant underground during dry conditions, but they feed during opportune times and use much of their energy to grow and build up fat reserves. Adults usually reach a length of 3-1/2 to 4 inches and live an average of four years.

Research

Scientists at the Savannah River Ecology Laboratory have studied marbled salamanders and other amphibian populations at the Savannah River Site continually since 1978. Because adult salamanders migrate at night, scientists encircle breeding sites with low fences that guide immigrating adults toward small buckets buried alongside the fences.

During the breeding season, thousands of salamanders fall into the open buckets, assuring scientists of capturing, counting and marking nearly all of the animals for future identification.

The scientists then release the salamanders. They often recapture the same salamanders leaving the bay as well.

This research allows scientists to learn more about amphibian populations and the importance of wetlands to their continued survival.

Did You Know?

- The bands on female marbled salamanders are more silver than males' bands, which are generally white.
- When nesting, female marbled salamanders generally seek out and select nest sites between the deepest and shallowest portions of the bay or pond. This behavior helps prevent eggs from hatching too early after any unseasonal thunderstorms that temporarily flood the deeper areas of the pond. But the position of the nests ensures that they will be flooded by early winter.
- Scientists across the world have reported a decline in numbers of amphibians of many species, including salamanders. Some of the decline is attributed to habitat destruction and pollution, but the declines in other areas have no apparent cause. However, a long-term study by the Savannah River Ecology Laboratory shows that amphibian populations naturally fluctuate widely over a period of time, with breeding populations in the thousands in some years and near zero in others.
- Amphibians can be an important food source for other animals, from ducks and wading birds to raccoons, as well as reptiles and other amphibians. Also, larval salamanders probably help control mosquito populations in some habitats.

***This information is provided as a public service by the Savannah River Ecology Laboratory Outreach office.*

Where in the World are Amphibians Going?

Amphibians are facing a myriad of problems around the world in nearly every type of habitat. Your students will discuss these problems and look for any patterns in this geography activity.

Objective: Students will seek to find connections between habitat, geographical location, and potential reason for current amphibian declines around the world.

Vocabulary: habitat loss, predator, toxic, pollution, bio-indicator

Background:
Amphibians throughout the world are in decline. In the last decade, more than 200 species have been documented to be in decline and about 20 species are presumed to have gone extinct. The most alarming thing is that most of these species in trouble have declined or disappeared from habitats that are protected from destruction and are located far from pollution sources. Not all amphibians have declined, but most alarming is that many have declined in our most protected areas including National Parks such as Yosemite, Sequoia, and Kings Canyon in California, USA. The same pattern has been documented in parks and protected lands in Puerto Rico, Costa Rica, Honduras, Panama, Venezuela, and Australia. No single cause has been identified which can explain this large-scale pattern, but various factors have been implicated. Below is a list of possible reasons for decline:

General habitat alteration and loss
Habitat modification from deforestation, or logging related activities
Intensified agriculture or grazing
Urbanization
Disturbance or death from vehicular traffic
Prolonged drought
Floods
Mining
Secondary succession
Drainage of habitat
Dams changing river flow and/or covering habitat
Subtle changes to necessary specialized habitat
Habitat fragmentation
Local pesticides, fertilizers, and pollutants
Long-distance pesticides, toxins, and pollutants
Predators (natural or introduced)
Introduced competitors
Disease - fungal and other
Deformity-causing parasitic worm (trematode) larvae
Loss of genetic diversity from small population phenomena
Barriers to movement and accidental traps
Intentional mortality (over-harvesting, pet trade or collecting)
Loss of distinctiveness through hybridization
Weakened immune capacity
Climate change, increased UVB or increased sensitivity to it, etc.

*** information provided by AmphibiaWeb http://elib.cs.berkeley.edu/aw/declines/index.html*

Related Subjects: geography, science

Materials: copies of Amphibian Loss cards (one for each student), large world map, open area for students to form groups

Procedures:

1. Make copies of the Amphibian cards included in this lesson plan. There should be enough for each student in the class. *Please note: these cards are only a partial list of the amphibian species in decline around the world, and are not representative of the total range of issues affecting amphibians.*

2. Distribute cards to students. Each card has an amphibian whose population has declined recently. Further information on the card includes the region of the world and specific country in which the amphibian can be found, the type of habitat it lives in, and one of the reasons that scientists believe may be causing the decline. Give the students a minute or so to study their cards.

3. Sort or group the students according to Region of the world: Australia, Asia, North America, South America, Europe, Central America, and the Caribbean. Ask the students, "Are amphibians declining in each of these regions?"

4. Sort or group the students according to the Habitat type: Mountain Forests, Rain Forests, Wooded areas, Streams or Rivers, Ponds or Lakes, Wetlands, Caves or Underground. Ask the students, "Are amphibians declining in each of these habitats?"

5. Finally, sort the students according to Suspected Reason for Decline: habitat loss or destruction, pesticides or chemicals, fungus or virus, predators, for food or medicines, weather changes, catastrophic events. Go around the room discussing each of the suspected reasons, by asking the students to read their card out loud.

6. Discuss what conclusions the class can draw? Do similar habitats have similar problems? Do certain regions of the world have certain problems? Using a large world map, ask the students to locate their animal's home region.

7. Share the list of potential causes listed in the Background section of this lesson plan. Worldwide amphibian declines seem to be caused by a variety of causes, and scientists from every region are studying local populations to pinpoint problems. It is an on-going issue with no clear answers. Your students may wish to follow up this exercise with additional research on the Internet, using the websites listed in the Resources section of this curriculum.

Region: Australia/Oceania
Country: New Zealand
Habitat: mountains
Amphibian: Archey's Frog
Suspected Reason for Decline: multiple

Region: Asia
Country: Sri Lanka
Habitat: cleared forests
Amphibian: Tree frog, Green frog
Suspected Reason for Decline: herbicides

Region: North America
Country: Canada
Habitat: St. Lawrence river system
Amphibian: Mudpuppy
Suspected Reason for Decline: pesticides

Region: North America
Country: western United States
Habitat: Yellowstone National Park
Amphibian: Columbia Spotted frog
Suspected Reason for Decline: climate change

Region: North America
Country: western United States
Habitat: Nevada desert
Amphibian: Amargosa toad
Suspected Reason for Decline: habitat destruction

Region: Europe
Country: England
Habitat: wetlands on the Isle of Jersey
Amphibian: Agile frog
Suspected Reason for Decline: unknown

Region: North America
Country: western United States
Habitat: mountains in Nevada
Amphibian: Mountain yellow-legged frog
Suspected Reason for Decline: fish predator

Region: Asia
Country: Russia
Habitat: rivers of Ekaterinburg
Amphibian: Marsh frog
Suspected Reason for Decline: thermal pollution

Region: Europe
Country: Italy
Habitat: forests, streams
Amphibian: European fire salamander
Suspected Reason for Decline: unknown

Region: North America
Country: western United States
Habitat: mountain forests
Amphibian: Northern Leopard frog, Spotted frog
Suspected Reason for Decline: unknown

Region: Central America/Caribbean
Country: Costa Rica
Habitat: cloud forest
Amphibian: Harlequin frog
Suspected Reason for Decline: dry climate conditions, fungal disease

Region: South America
Country: Venezuela
Habitat: wooded areas near cities
Amphibian: Painted frog
Suspected Reason for Decline: unknown

Region: Australia/Oceania
Country: Australia
Habitat: forests of Queensland
Amphibian: multiple species
Suspected Reason for Decline: fungus

Region: North America
Country: western United States
Habitat: Yellowstone National Park
Amphibian: Columbia Spotted frog
Suspected Reason for Decline: introduction of non native fish

Region: Central America/Caribbean
Country: Costa Rica
Habitat: cloud forest
Amphibian: Golden toad
Suspected Reason for Decline: unusual warm, dry weather pattern

Region: Eurasia
Country: Former Soviet Union
Habitat: forests
Amphibian: Marsh frog
Suspected Reason for Decline: deforestation

Region: Central American/Caribbean
Country: Puerto Rico
Habitat: streams
Amphibian: Schmit's frog
Suspected Reason for Decline: loss of habitat

Region: Central American/Caribbean
Country: Puerto Rico
Habitat: rain forest
Amphibian: Puerto Rico live-bearing frog
Suspected Reason for Decline: loss of forests

Region: Central American/Caribbean
Country: Haiti
Habitat: rain forest
Amphibian: Tree frog
Suspected Reason for Decline: loss of forests for firewood

Region: Asia
Country: Philippines
Habitat: island caves with high humidity
Amphibian: Negros cave frog
Suspected Reason for Decline: loss of habitat caves

Region: North America
Country: NW United States
Habitat: wetlands adjoining farmlands
Amphibian: Oregon Spotted frog
Suspected Reason for Decline: nitrate fertilizer run-off

Region: Asia
Country: mainland China
Habitat: streams, wooded areas
Amphibian: salamander
Suspected Reason for Decline: collected for traditional medicines

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Region: Europe
Country: Spain
Habitat: forests, wooded areas
Amphibian: Common Mid-wife toad
Suspected Reason for Decline: fungus

Region: Asia
Country: Tibet
Habitat: lakes
Amphibian: Green frog
Suspected Reason for Decline: loss of habitat, lakes drained for farms

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Region: southern Asia
Country: Bangladesh
Habitat: wetlands
Amphibian: China frog
Suspected Reason for Decline: loss of habitat and agricultural chemicals

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Region: Central America
Country: Peru
Habitat: high elevation forests
Amphibian: Harlequin toad
Suspected Reason for Decline: fungus

Region: Europe
Country: Great Britain
Habitat: streams, wooded areas
Amphibian: Great Crested newt
Suspected Reason for Decline: fish predation

Region: North America
Country: western United States
Habitat: streams
Amphibian: Tiger salamander
Suspected Reason for Decline: iridiovirus

Region: Caribbean
Country: island of Montserrat
Habitat: upland forests
Amphibian: Mountain Chicken frog
Suspected Reason for Decline: volcanic fallout polluting water, use as food

Taking Advantage of Local Resources

Contact local institutions and scientists to solicit their assistance in your Amphibian Alert! classroom programs and field activities.

Background:

It is important that students have opportunities to experience amphibians in their native habitats in order to better understand these animals' roles. Local experts may be available to enhance the experience. Research on amphibians is occurring throughout the United States and in many other parts of the world – there may be an interesting connection right in your own backyard; at a local college, university, museum, aquarium, or zoological park.

Following is a sample letter to help you contact experts in your area:

Dear _____,

I am a teacher at _____. This semester, we will be studying the problem of declining amphibian populations. A major goal of this unit, which was developed by the Declining Amphibian Populations Task Force and the American Zoo & Aquarium Association, is to give first-hand contact with amphibians and their habitats. Since you are closely associated with natural resources, we would very much appreciate if you could volunteer your time, expertise or resources to our class. We would like to invite you to speak to our students on your programs involving local amphibian populations, as well as potential careers with wildlife studies. Additionally, we hope you would be available to lead us on a field trip to observe amphibians and/or amphibian larvae in their natural settings. We could help with a frog count, or installing signs to warn drivers about "frog crossing" areas, or testing the waters at a local pond. If this is not possible, I would appreciate knowing what other options you suggest would be of interest to our students.

Thank you for your time and consideration. My students and I look forward to hearing from you soon.

Sincerely,

Nature is My Neighbor

Nature is all around us- your students will explore their neighborhood and schoolyard for evidence of amphibians and other wildlife.

Objective: to increase awareness of, and familiarize students with, nature in their surrounding region (i.e. schoolyard, back yard, local parks).

Related Subjects: science, language arts, art

Materials: local field guide books, copies of "Nature is My Neighbor" Field Guide Notes handout, paper and pencils, paper for additional drawings

Procedures:

1. Introduce the unit by discussing basic needs of all life. Solicit answers from students. All animals need food, water, and shelter in the appropriate configuration. These are all part of an animal's habitat. Nature is all around us, in our schoolyards, playgrounds and backyards. In this activity, we're going to look closely to find evidence of animal presence.

2. Take the students on "nature hike" in the schoolyard for signs of animal life. Divide the students into pairs or teams to search the school yard for evidence that animals have been around - spider webs, nests, burrows, feathers, tracks, and droppings. Be sure not to disturb anything! Allow teams to explore for 10 minutes. Students should keep notes on what they find, sketching or describing it and naming it if they can. Provide copies of the "Nature is My Neighbor" Field Guide Notes form provided.

3. Re-gather the class to share their findings. What types of evidence did they find? Encourage the students to use new vocabulary terms to describe their animals, i.e. mammal, bird, reptile, amphibian, or invertebrate. Ask if they observed any features on the animals that would be considered an adaptation. Are there any adaptations that help the animal to find and eat food? Are there any adaptations that help it to hide from other animals?

4. Compile the students' completed observations into a classroom Field Guide. Have students conduct research about the diets and behaviors of the animals for which they saw evidence on their "nature hike." Making a Field Guide takes a long time, lots of patience, and is often a team effort. The more eyes and minds helping on the project, the better the final product will be. Once it is completed, your Field Guide can be shared with other classes as they explore the schoolyard habitat.

5. What if you find that your schoolyard habitat doesn't have a lot of wildlife? Or your school is located in an area that doesn't have natural areas near it? Follow the steps outlined on *Creating a Frog-friendly Schoolyard* sheet to invite amphibians to your schoolyard, or create a desktop or shoebox model.

Nature is My Neighbor
Field Guide Notes

Habitat (be sure to note locations or sources of water)_____

_____

Name of Animal/Plant _____

Description or Evidence _____

_____

Mammal Bird Reptile Amphibian Insect or Spider

Behaviors _____

_____

Calls/Sounds _____

_____

Drawing/Sketch of location

Creating a Frog-friendly Schoolyard

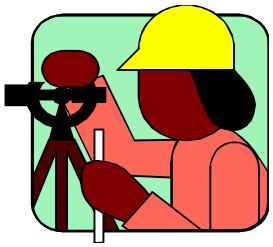
Your students will invite wildlife into their schoolyard in this on-going project that can involve parents, local businesses and the whole school in transforming part of the grounds.

A Schoolyard Wildlife Habitat can be an outdoor laboratory, alive with learning opportunities for your students. Schoolyard Wildlife Habitats are designed to attract wildlife by providing elements crucial to wildlife survival: food, water, cover, and places to raise young. Natural wildlife habitat is disappearing quickly. Creating a frog-friendly habitat is the perfect way for your school to help conserve wildlife while being able to enjoy observing it. *For complete information on Backyard and Schoolyard Habitats, please contact the National Wildlife Federation at* www.nwf.org.

Even if you can't change a schoolyard, or you live in an area without woods or streams, your class can still create a desktop or shoebox model of their ideal "frog-friendly" habitat. Go through the same steps listed below to create a scale model, and then decorate it with pictures to illustrate the plants, animals, and ever-important source of water for your new neighbors to thrive in. Use your imagination!

Every school situation is unique. However, you should go through the following steps to ensure the success of your habitat- for the students as well as the animals!

- Form a Project Team that includes students, teachers, parents, maintenance staff and local businesses (such as a nursery or landscaping company and wildlife experts). This team will work together on the following steps:

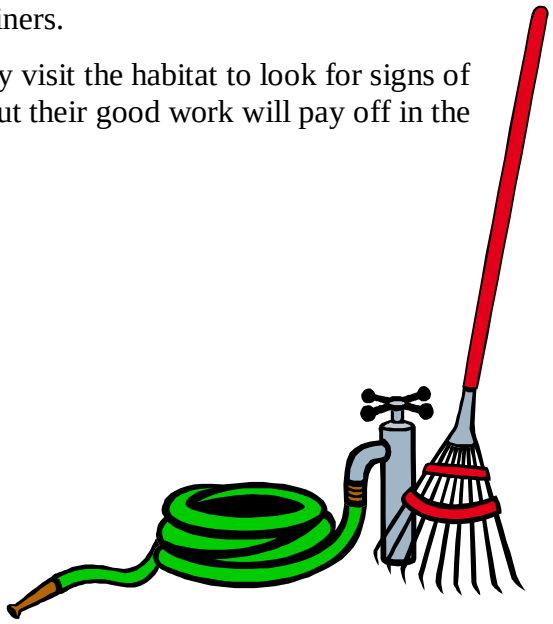


- Conduct a site survey and create a map of the area you wish to make "frog-friendly." Involve the students as much as possible - measuring, drawing, identifying features, etc. Look for water features, natural hiding places for amphibians, potential problems, etc. Groups building desktop models can create their ideal site, including the features they believe would attract amphibians.
- Develop a clear and realistic plan for your habitat. Involve your local business representative, or seek assistance from a local university or state fish and wildlife office. They may have staff involved in amphibian research nearby who would be willing to come talk to the class.

- Gather materials to create habitat. Remember to include the four basic requirements for survival: food, water, shelter, and safe place to raise young. Availability of water is a key factor when creating habitat for amphibians. This step may involve some fundraising or gathering donations from parents or businesses. (You may need to "downsize" the project at this stage!) Groups building desktop models will need to gather pictures and craft materials to help bring their model to life!

- Now comes the fun! Create your frog friendly schoolyard or tabletop model! Get messy and have some fun. Students may want to add rock piles, brush piles, bring in rotting logs, create a small pond, install a light to attract bugs, etc. Remind them that it doesn't have to look pretty… it needs to be frog friendly. Desktop model teams can use natural materials as well as craft supplies.

- Create a maintenance plan for the schoolyard habitat, dividing the work among the students and adult helpers. Remember that your habitat will need attention all year round in order to stay in the best shape. Remind the students that they are the primary maintainers.
- Establish an observation team that will regularly visit the habitat to look for signs of wildlife. Changes will not happen overnight, but their good work will pay off in the near future.



Getting Involved in "Frogwatch USA" and Other Counts

Become part of a national program when your students participate in local amphibian population assessment studies though Frogwatch, USA.

Objective: to increase understanding of local amphibian populations by participating in a frogwatch or other regional population assessment program.

Vocabulary: habitat, population, ecosystem, diurnal, nocturnal, terrestrial, aquatic

Related Subjects: mathematics, language arts

Materials: access to Internet to obtain full information on Frogwatch program

Welcome to Frogwatch USA!
This Web site is the Internet presence of an educational frog-monitoring program coordinated by the US Geological Survey Patuxent Wildlife Research Center. Frogwatch USA relies on volunteers, like you, to collect information regarding frog populations in neighborhoods across the nation. Please explore the Web site http://www.mp2-pwrc.usgs.gov/frogwatch/ and see if you would like to become a Frogwatch USA volunteer.

What is Frogwatch USA?
It is well recognized among scientists that amphibian populations have declined. Several species are now extinct and once-thriving populations have diminished in numbers. Understanding the decline of amphibian populations is crucial in uncovering how people's activities are affecting water quality, wildlife habitat, and other aspects of our environment. Frogwatch USA is a long-term frog and toad monitoring program that complements ongoing amphibian monitoring efforts across the USA. Frogwatch USA:

- Collects important information about frog populations across the USA
- Promotes an appreciation for diversity of frogs
- Fosters an understanding of the importance of wetlands within our changing landscapes
- Provides an opportunity for children and adults to learn more about and establish a relationship with the natural world

How does Frogwatch USA work?

Frogwatch USA relies on volunteers, like yourself, across the nation to collect valuable data. Volunteers participate by:

- Learning the life histories and the voices of their local frogs
- Choosing safe and convenient wetlands to monitor; often in backyards or local parks
- Periodically monitoring sites by listening – "frogwatching" - three minutes for frogs after dusk
- Registering and submitting findings via the Frogwatch USA Web site

Visit the Frogwatch USA webpages to learn how you can get involved and help!
There are complete instructions on How to Frogwatch and Data Sheets to use.
www.nwf.org/keepthewildalive/frogwatch-app

Resources and Websites

Note: There are many websites with information on the study and conservation of amphibians, both locally and internationally. This information is constantly updated based on the latest scientific research. You and your students may wish to use the following sites when conducting research for any of the ***Amphibian Alert!*** *activities.*

The Declining Amphibian Populations Task Force (DAPTF)
http://www.open.ac.uk/daptf/index.htm

FROGLOG
http://www2.open.ac.uk/biology/froglog/

Frogwatch USA
http://www.mp2-pwrc.usgs.gov/frogwatch/

AmphibiaWeb
http://elib.cs.berkeley.edu/aw

FrogWeb
http://www.frogweb.gov/index.html

North American Amphibian Monitoring Program (NAAMP)
http://www.im.nbs.gov/amphibs.html

An Online Guide for the Identification of Amphibians in North America north of Mexico
http://www.npwrc.usgs.gov/narcam/idguide/

A Thousand Friends of Frogs
http://cgee.hamline.edu/frogs/

Tree of Life: Living Amphibians
http://phylogeny.arizona.edu/tree/eukaryotes/animals/chordata/living_amphibians.html

American Zoo and Aquarium Association (AZA)
www.aza.org