

Follow-up Activities

- As a group, research the threats amphibians face in the wild (habitat loss, pollution, acid rain). Discuss the theory that changes in the environment have made it more difficult for amphibians to survive. In small groups, have the students research these changes, looking for ways that humans may be able to keep amphibians from extinction.
- Set up a tadpole habitat in your classroom. Have students observe and document the growth stages from egg to tadpole to frog. Refer to the "EEK!: Raising Frogs in the Classroom" Web page (<http://www.dnr.state.wi.us/org/caer/ce/eek/teacher/frogact.htm>) for guidelines.
- Participate in an amphibian census after taking a field trip to a local pond to search for amphibians. Information about participation in an amphibian survey can be found at <http://www.npwrc.usgs.gov/narcam/form/form1.htm>.
- Have students choose an amphibian to research and create a presentation that includes pictures and information on the function of different adaptations that are unique to their animal.

Internet Resources

- www.npwrc.usgs.gov/narcam/idguide/specieid.htm
This "Species Identification Guide" presents photographs and information about many North American amphibians.
- www.frogweb.gov/education.html
This site includes general information about amphibians and their habitats; research programs in which the public can participate in collecting amphibian data; classroom activities to raise awareness of amphibian biology and populations; and links to dozens of informative and fun sites across the Web.
- www.pca.state.mn.us/kids/frogsforkids.html
The Minnesota Pollution Control Agency "Frogs for Kids" web site has strange frog facts, a live "frog cam," frog jokes and information about deformed frogs.
- www.mp1-pwrc.usgs.gov/amphib/tools/teachers.html
This site lists suggestions for incorporating amphibian conservation studies into the classroom.
- wise.berkeley.edu/WISE/demos/frog-activity/
The "Deformed Frogs Mystery" is an interactive project that encourages students to investigate the possible cause of deformity in amphibians.

Suggested Print Resources

- Elliott, Lang. *The Calls of Frogs and Toads*. NatureSound Studio, Ithaca, NY; 1998.
This title is an audiocassette with a 44-page booklet.
- Fridell, Ron. *Amphibians in Danger: A Worldwide Warning*. Franklin Watts, Inc., New York, NY; 1999.
- Julivert, Mary Angels. *The Fascinating World of Frogs and Toads*. Barrons, New York, NY; 1993.
- Snedden, Robert. *What Is an Amphibian?* Sierra Club, San Francisco, CA; 1994.
- Swan Miller, Sara. *Salamanders: Secret, Silent Lives*. Franklin Watts, New York, NY; 1999.

TEACHER'S GUIDE CONSULTANT

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TITLES

- AMPHIBIANS
- ANIMAL ADAPTATIONS
- ANIMAL BEHAVIOR & COMMUNICATION
- ANIMAL CLASSIFICATION
- ANIMAL INTERDEPENDENCY
- ANIMAL LIFE CYCLES
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Amphibians

Grades 5-8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers for these grades need all the help they can get! This guide has been designed to help science teachers in grades 5-8 by providing a brief synopsis of the program, pre-viewing and follow-up questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create an "Everything We Think We Know About..." list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About..." list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.

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Program Summary

Ancient fossil evidence shows that about 350 million years ago, vertebrates related to lobe-finned fish crawled out of the vast oceans and began adapting to life on land. These animals spent part of their lives in water and part on land, earning them the name amphibians. In order for these creatures to leave their water environments, amphibians underwent many physical changes over millions of years. They developed lungs to breathe the air and limbs suited for walking on land. They also lost the scales that covered their bodies as fish and developed smooth, moist skin to take in both water and air.

There are over 3,000 different species of amphibians living in the world today, grouped by scientists into Class Amphibia. Within Class Amphibia, there are three distinct groups, known as orders. Order Anura, the largest group, is made up of frogs and toads. Salamanders and newts are members of Order Urodela. The smallest group, Order Apoda, is made up of blind, largely underground animals that have no limbs.

Although most amphibians have adapted to life on land, they remain highly dependent upon water for their survival. They must lay their eggs in water, most of which develop into fishlike tadpoles with gills and tails. As tadpoles develop, they go through major changes in appearance in a process called metamorphosis. Frog tadpoles develop legs, grow lungs and lose their tails. They emerge from the water in their adult stage, but must remain close to fresh water even as adults. If their skin becomes too dry, they die.

Amphibians have developed interesting adaptations that protect them from predators. Dr. Ken Nagy, a herpetologist, discusses the protective role of poison mucus and reviews the eating habits of some amphibians.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

amphibian — A cold-blooded vertebrate that lives part of its life in water and part on land. Frogs, toads, newts and salamanders are amphibians. “Amphibious” is a term used to describe anything that is adapted for both land and water.

evolution — The process of gradual change that occurs in species of animals over time, eventually producing new species.

cold-blooded — A term that describes animals that cannot control their own body temperature, therefore assuming the temperature of their environment.

lateral line — A line of sensory organs running along the side of fish and some tadpoles, used to navigate and to sense the approach of other creatures.

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Class Amphibia — The scientific name for all amphibians.

Order Anura — The scientific name given to the group of animals known as jumping amphibians, like frogs and toads.

Order Urodela — The scientific name given to tailed amphibians, like salamanders and newts.

Order Apoda — The scientific name given to a small group of blind, limbless, underground amphibians.

estivation — A state of dormancy that many amphibians can enter when the environment gets too dry by burrowing into the ground and entering a sleep-like state.

hibernation — A state of dormancy that many animals can enter in winter when the environment gets too cold by burrowing into the ground, in water or under logs, and entering a sleep-like state until it gets warmer.

metamorphosis — The process of development in which a young organism undergoes major changes in appearance to become an adult. Amphibians have a life cycle in which they develop into fish-like creatures, without lungs or limbs, called tadpoles. Over time, their bodies change to become air-breathing adults with limbs.

herpetologist — A scientist who studies reptiles and amphibians.

permeable — Having pores or openings that permit liquids or gases to pass through. An amphibian’s skin is permeable, because it allows water and air to pass through.

mucus — A slimy coating that protects the skin of amphibians. Some amphibians have mucus that is poisonous.

Pre-viewing Discussion

Before students generate their list of “Everything We Think We Know About...” for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

1. Name some examples of amphibians.
2. What species of animals are amphibians most similar to? Why?
3. What traits do most amphibians have which makes them different from other animals?

After the class has completed their “Everything We Think We Know About...” list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. What does the word “amphibious” mean?
2. From what structures of early fish did the legs of amphibians evolve?
3. How do amphibians breathe?
4. How does mucus help amphibians survive?
5. What group of animals is believed to have evolved from amphibians?
6. How are amphibians and reptiles different?
7. Are amphibians cold- or warm-blooded? What does that mean?
8. What physical characteristics describe animals in Order Anura?
9. What characteristics belong to animals in Order Urodela?
10. What is so unique about the animals in Order Apoda?
11. How is water critical to amphibian survival?
12. Why do amphibians have to lay their eggs in water or in moist environments?
13. What is estivation? When do amphibians estivate?
14. How is hibernation different from estivation?
15. Describe the defense mechanisms that some amphibians have to keep themselves from being eaten.
16. Summarize the stages of a frog’s metamorphosis.
17. How are adult frogs different from tadpoles?

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their “Everything We Think We Know About...” list. It might also be helpful to review the list by marking each entry with a “+” or “-” to show which facts were correct and which were incorrect.

Discussions that ensue from thought-provoking questions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion questions.

1. Discuss the presence of a lateral line in tadpoles as an indication that amphibians evolved from fish.
2. Explain the meaning of this statement from the show: “350 million years ago, there was competition for food in the water and danger from predators; however, on land, there was only food.”
3. Discuss the reasons why our world is not overrun with amphibians even though some frogs and toads can lay thousands of eggs.