- Brainstorm ways to preserve the Earth's water supplies from pollution. Discuss how students can be involved in keeping the Earth's water clean.
- Ask students to explain how water is purified during the water cycle.

Follow-up Activities

- To see evaporation and condensation in action, students can boil water with the help of adults, have the escaping vapor make contact with a bowl of ice and watch the vapor as it condenses on the bottom of the bowl. Students can also vary this activity by determining how much of a measured amount of water can be recaptured through condensation by using a pie plate to collect the water that drips from the bottom of the bowl.
- The Earth's wetlands are important components of the water cycle. Students can research the significance of wetlands for plants and animals, and discuss how humans have only recently determined the value of wetlands around the world. (See www.athena.ivv.nasa.gov/curric/land/wetland/index.html for more information and activities about wetlands.)
- Encourage students to track their water usage over several days, recording when, where and for what purpose they use water. After sharing their records with the class, students can brainstorm ways to conserve water at home and at school.

Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.libraryvideo.com

- **ga.water.usgs.gov/edu/index.html**
  The U.S. Geological Survey sponsors a "Water Science for Schools" web site that offers a great deal of information about the Earth's water supply. Topics presented on this site include the location, amount and quality of the Earth's water. Students can even follow a drop of water through the water cycle.
- **www1.umn.edu/bellmuse/mnideals/watershed/watershed2.html**
  The Watershed Game, presented by the University of Minnesota, provides children with an opportunity to act as a national park planner, a farmer, a neighborhood activist or a city planner who must make good decisions about the Earth's water supplies. Students can also take a quiz to test their knowledge of watersheds and water usage.
- **www.epa.gov/OGWDW/kids/**
  This web site sponsored by the Environmental Protection Agency presents information about drinking water for children. Games and activities are offered that contain water trivia and little-known facts. The experiment section provides many excellent ways to learn about the science of water. Other water education links are suggested. ***(Continued)***

- **www.acnatsci.org/education/river/index.html**
  "Water: From the River to You," a web page sponsored by the Academy of Natural Sciences, gives some great information about our "water planet," especially in terms of water pollution and conservation. Student activities are also provided.

Suggested Print Resources

- Beck, Gregor Gilpin. *Watersheds: A Practical Handbook for Healthy Water.* Firefly Books, Willowdale, Ontario; 1999.
- Cole-Misch, Sally, Larry Price and David Schmidt. *Sourcebook for Watershed Education.* Kendall/Hunt Publishing Company, Dubuque, IA; 1996.
- Crowder, Jane Nelson and Joe Cain. *Water Matters, Water Resources Teaching Guide Volume 3.* National Science Teachers Association Press, Arlington, VA; 1999.
- Lauw, Darlene. *Water (Science Alive!).* Crabtree Publishing, New York, NY; 2002.

TEACHER'S GUIDE CONSULTANT

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TITLES

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Earth Science IN ACTION™

The Water Cycle

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 at these grades need all the help they can get! This guide has been designed to help the 5-8 science teacher by providing a brief synopsis of the program, previewing 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

The Earth has roughly the same water supply that it had billions of years ago; it is just recycled through a process called the water cycle. The Earth's water cycle is fueled by the sun's energy. When sunlight reaches water, the energy is transformed into heat, which changes liquid water into water vapor through evaporation. Wherever water contacts the air — in oceans, lakes and streams, soil and even in animals and plants — liquid water is turned into water vapor, which rises into the atmosphere. The warmer the air, the greater the amount of water vapor it can hold. When the air cools, the vapor condenses into clouds, fog, haze, dew on grass and even moisture on the outside surfaces of glasses of cold drinks. When air carrying tiny water droplets cools further, the droplets grow in size, eventually becoming too heavy, and fall back to Earth as rain, snow, sleet or hail. When water condenses and falls, it collects in lakes, ponds and reservoirs, or soaks into the ground and becomes groundwater. The water that doesn't soak into the ground runs off the land and drains into streams and rivers, which eventually return that water to the atmosphere as water vapor and the cycle begins again.

People create dams in rivers in order to collect fresh water in reservoirs. These dams provide reliable sources of drinking water, prevent flooding and generate electricity. Some of the water used by people is taken from the supply of groundwater trapped underground by impermeable layers of clay or rock. The level of this underground water supply, called the water table, rises and falls, depending upon the amount of water that soaks into the ground and the amount that is pumped out through wells. Although humans routinely recycle and clean water into which wastes have been dumped, one of the greatest dangers to the Earth's water supply is the pollution of groundwater. Government agencies monitor the quality of groundwater and running water very closely in order to preserve the Earth's sources of clean water.

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.

water — The liquid that descends from the clouds as rain, forms streams, lakes and seas, and is a major component of all living matter. Water is found as a liquid, a solid and a gas on the Earth.

liquid — A fluid substance that does not have a definite shape but has a definite volume. Water is found in a liquid state between the temperatures of 0 and 100 degrees Celsius.

solid — A substance with a definite shape and volume. Water freezes into a solid (ice) at 0 degrees Celsius.

gas — An invisible substance with no definite shape or volume. Liquid water turns into a gas when it boils at 100 degrees Celsius.

water vapor — Water that is in a gaseous form in the air and condenses into clouds. ***(Continued)***

water cycle — The continuous recycling of the Earth's water supply through the evaporation of liquid water into the atmosphere as water vapor and the condensation of cooled water vapor in the atmosphere, which falls as precipitation in the form of rain, snow, sleet or hail. This process is fueled by the sun's energy.

evaporation — The process by which liquid water is changed into water vapor. When sunlight reaches water, the sun's energy turns the water into water vapor.

condensation — The process by which water vapor in the atmosphere is turned into liquid water. When vapor in the air is cooled, it condenses into droplets.

dew — Water droplets that condense on the ground or grass.

precipitation — The process by which water vapor cools and condensed drops of water fall out of the atmosphere in the form of rain, snow, sleet or hail.

drought — A period of dry weather. This extreme weather condition can be harmful to plants, animals and other living things on the Earth's surface.

runoff — Water that falls as precipitation and does not soak into the ground or evaporate. This water flows into creeks, streams and rivers.

watershed — A region of land from which runoff drains into a particular river or a system of rivers, creeks and streams.

standing water —Water that is collected in low places on the Earth's surface and does not flow. Ponds, lakes and reservoirs are examples of standing water.

reservoirs — Artificial lakes that provide reliable supplies of fresh water.

groundwater — Water that soaks into the ground and is trapped and stored by layers of clay or rock.

water table — The upper level of the underground water supply. Below the water table, the ground is soaked with water.

permeable — Having openings that let substances like water or gas pass through.

artesian well — A well from which the groundwater that is trapped by impermeable rock layers spurts to the surface.

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:

- What is the Earth's "water cycle"? Why is it called a cycle?
- Why is water important for life on Earth?
- How does pollution threaten the Earth's water supply?

(Continued)

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. Why is the Earth called the water planet?
2. What physical properties make water unique as compared to other substances on Earth?
3. Where is most of the Earth's fresh water supply stored?
4. What is the water cycle?
5. Why do we say that the Earth's water is recycled?
6. What is evaporation? How does it occur?
7. If oceans are constantly losing water through evaporation, why aren't they becoming more shallow and salty all the time?
8. What do we know about the atmosphere and its ability to hold water vapor?
9. What is condensation? What causes it? Name visible examples of condensation.
10. What is the relationship between condensation and precipitation?
11. What happens to precipitation after it falls to the Earth's surface?
12. What is groundwater? Why is it important?
13. Compare running water, standing water and groundwater.
14. What is the significance of runoff?
15. What does groundwater have to do with the water table?
16. Why is the pollution of groundwater so serious?

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.

- Have students explain what is meant by the statement, "The water molecules in a puddle during the time of the dinosaurs are the same ones found on Earth today." ***(Continued)***