The NASA SCI Files™
The Case of the
Wacky Water Cycle

Segment 4

As the tree house detectives try to find the answers to their questions about water use, they visit Busch Gardens, Williamsburg, Virginia to learn more about water conservation. Mr. Brian Nadeau of Water Country, USA explains the importance of water recycling but can't give them a solution for their car wash problem. Finally, the detectives turn to Ms. Hillegass of the Hampton Roads Water Efficiency Team (HRWET). They learn some surprising things about using water wisely and return to the tree house just in time to hear a KSNN™ update that will make their day and wash their blues away!

Objectives

The students will

- simulate the steps in the water treatment process.
- describe land use activities within a watershed by analyzing water quality.
- learn what happens to groundwater when more and more water is used.
- construct and calibrate a shower timer that can help conserve water.
- practice using metric measurements.
- identify plant and animal adaptations.
- estimate the water content of certain foods.

Vocabulary

adaptations – physical traits that allow a plant or animal to change to fit its surroundings

conservation – protecting resources from being lost or used up

drought tolerant – adaptations that allow a plant to go for long periods of time without water

purify – to make clean; to remove dirt or other materials

recycle – to use again in a new way

tributaries – small streams that flow into larger bodies of water

Video Component

Implementation Stratey

The NASA SCI Files™ is designed to enhance and enrich the existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Prior to viewing Segment 4 of *The Case of the Wacky Water Cycle*, discuss the previous segment to review the problem and what the tree house detectives have learned thus far. Download a copy of the Problem Board from the NASA SCI Files™ web site in the tree house section and have students use it to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 3 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have been dispelled during Segment 3. Use tools located on the Web, as was previously mentioned in Segment 3.
4. Focus Questions—Print the questions from the web site ahead of time for students to copy into their science journals. Encourage students to take notes during the program to answer the questions. An icon will appear when the answer is near.

View Segment 4 of the Video

For optimal educational benefit, view *The Case of the Wacky Water Cycle* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. At the end of Segment 4, lead students in a discussion of the focus questions for Segment 4.
2. Have students discuss and reflect upon the process that the tree house detectives used to learn about the water cycle and solve the water table problem. The following instructional tools located in the educator's area of the web site may aid in the discussion: Experimental Inquiry Process Flowchart and/or Scientific Method Flowchart.

3. Choose activities from the educator guide and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
4. Wrap up the featured online Problem-Based Learning (PBL) investigation. Evaluate the students' or teams' final product, generated to represent the online PBL investigation. Sample evaluation tools can be found in the educator's area of the web site under the main menu topic "Tools" by clicking on the "Instructional Tools."
5. Have students write in their journals what they have learned about the water cycle, water uses, water conservation, and/or the problem-solving process and share their information with a partner or the class.

Careers

resource conservationist
water park manager

Resources

Books

Blobaum, Cindy: *Geology Rocks*. Williamson Publishing, 1999, ISBN: 1885593295.

Berger, Melvin: *Oil Spill!* HarperCollins Children's Books, 1994, ISBN: 0064451216.

Cherry, Lynne: *A River Ran Wild*. Harcourt, 2002, ISBN: 0152163727.

Duvall, Jill D.: *Who Keeps the Water Clean? Ms. Schindler!* Scholastic Library, 1997, ISBN: 0516261525.

Kensler, Chris: *Secret Treasures and Magical Measures: Adventures in Measurement*. Kaplan, 2003, ISBN: 0743235258.

Maass, Robert: *Garbage*. Henry Holt & Company, 2000, ISBN: 0805059512.

Pallota, Jerry: *Hershey's Milk Chocolate Weights and Measures*. Scholastic, Inc., 2003, ISBN: 0439388775.

Pringle, Laurence: *Oil Spills, Volume 1*. Morrow, William, and Co., 1993, ISBN: 0688098614.

Rand, Gloria: *Prince William*. Henry Holt & Co., 1994, ISBN: 080503384X.

Ross, Michael Elsohn: *RE-Cycles*. Millbrook Press, 2002, ISBN: 0761318186.

Schwartz, David M.: *Millions to Measure.* HarperCollins Publishers, 2003, ISBN: 0688129161.

Wilcox, Charlotte: *Trash!* Lerner Publishing, 1988, ISBN: 0876143117.

Resources (concluded)

Web Sites

Virtual Field Trips: Salt Marshes
Students will be introduced to the coastal environment through participation in a field study of the beach, dunes, estuary, and salt marsh habitats. This informative virtual field trip contains beautiful pictures and interesting information.
http://www.tramline.com/sci/salt

A Wetlands Food Web Story
Read an interactive story about a wetlands marsh and learn about the plants and animals that live there.
http://www.natureillinois.org/natwrks.htm

Water Recycling Center
Learn about alternative wastewater treatments, the importance of natural wetlands, and the benefits of water recycling on the site sponsored by the Triangle School Wastewater Treatment Facility in North Carolina.
http://www.waterrecycling.com/overview.htm

The Edwards Aquifer and San Antonio Water System
Learn about aquifers and how water tables are measured.
http://www.saws.org/our_water/

America's Wetlands
Investigate the wonders of wetlands as you look at the unique plants and animals that live there as well as the benefits of wetlands to our world.
http://www.epa.gov/OWOW/wetlands/vital/toc.html

Busch Gardens Teachers' Guides
Check out these online resources for more activities and information about the animals that live in Sea World.
http://www.seaworld.org/just-for-teachers/guides/index.htm

Science for Ohio: The Water Cycle
Make a water cycle spinner game or check out resources related to the water cycle on this site for teachers and students.
http://casnov1.cas.muohio.edu/scienceforohio/Water1/index.html

Activities and Worksheets

On the Web

Adaptations
Do some research to find out what kinds of adaptations plants and animals have that help them survive in different climates and habitats.

Water Bodies
Learn about the water content of the foods you eat by doing this online investigation and then dehydrating some of your favorite fruits and vegetables.

Giving Water the Treatment

Materials

200 mL tap water
foam cup
3 clear plastic cups
small, clean bowl
paper towel
5 mL powdered alum (available from drugstore)
160 mL clean sand
80 mL clean gravel
2 drops of yellow food coloring to simulate chlorine
10 mL dirt (2 tsp)

Problem

To simulate the steps in the water treatment process

Background

A water company goes through several steps to ensure safe and pure drinking water for the community. The water that has been processed typically goes through the following steps:

aeration – water is sprayed into the air to release trapped gases and to absorb additional oxygen.

coagulation – powdered alum is dissolved in the water, forming sticky particles called floc, which attach to suspended dirt particles in the water.

sedimentation – the heavy particles of floc settle to the bottom of the tank, and the clear water above is skimmed from the top and sent on to the next step.

filtration – as the clear water passes through layers of sand, gravel, and charcoal, small particles are removed.

chlorination – a small amount of chlorine gas is added to kill any bacteria or microorganisms that may be in the water.

Procedure

1. In a plastic cup, mix 5 mL dirt and then 200 mL of tap water. Stir well. Label cup 1.
2. Repeat step 1 with a second plastic cup. Label this cup "control" and set it aside.
3. Observe the mixtures and record your observations in your science journal.
4. Using an empty cup, aerate the water in cup 1 by pouring it back and forth into the empty cup several times to release trapped gases. See diagram 1.
5. Observe and record.
6. Add 2.5 mL alum to the water.
7. Let the mixture stand for 10–15 minutes. Observe and record.
8. To create a "filter," use a sharp pencil to poke ten small holes in the bottom of the foam cup.
9. Put a layer of gravel in the bottom of the foam cup.
10. Add a layer of sand on top of the gravel.
11. Hold the filter cup above a clean bowl.
12. Carefully pour the water from cup 1 into the filter cup, leaving behind the sediment at the bottom.
13. Observe what happens to the floc particles as they pass through the sand and gravel. Record your observations.
14. A small amount of disinfectant is added at this final stage to kill remaining bacteria and other microorganisms. Add 2 drops of food coloring to the water to represent this step.

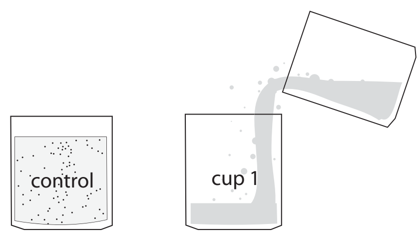


Diagram 1

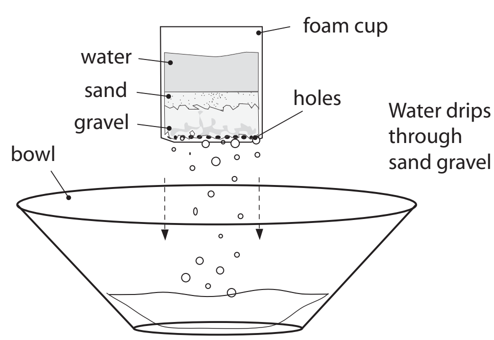


Diagram 2

Giving Water the Treatment (concluded)

15. DO NOT drink or taste the water.
16. Compare your finished product with the control cup.
17. Record your observations in your science journal.
18. Discuss your findings with your group or class and create a list of other kinds of filters that might help purify water.

Conclusion

1. Why do we need water treatment plants?
2. What is the purpose of adding the alum to the water?
3. Why should chlorine be added to the water at the end of the process?
4. What can you learn about the water cycle from this activity?

Extensions

1. Make arrangements to visit the water treatment facility in your area and find out what type of water treatment process is used.
2. Make a booklet illustrating the steps to the water treatment process.
3. Read about an oil spill such as the one from the Exxon Valdez. How did workers help clean up the oil spill? What kinds of materials were used to help clean the water? How did the oil spill affect the environment? Share your findings with the class.

Pollution Perils

Problem

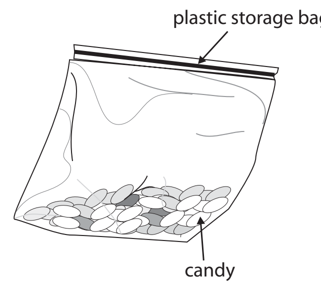
To describe and identify land use activities within a watershed by analyzing water quality

Materials

3–6 different colored candies
small, plastic bags
graph paper
colored pencils
copies of Land Use Table

Background

A watershed (drainage basin) is an area of land where all the water drains to the same location. Watersheds may be large, such as the Mississippi River drainage basin, or small, such as the 40 acres that drain into a farm pond. Nonpoint source pollution has many different sources, usually associated with rainfall and snowmelt runoff moving over and through the ground, carrying natural and human-made pollutants into lakes, rivers, streams, wetlands, and groundwater. Pollutants accumulate in watersheds as a result of various practices and natural events. If we can determine the type of pollutant, then we cannot only classify the source of the pollutant, but also take preventive measures to stop any further contamination.



Teacher Preparation

Students may complete this activity, individually or in a small group. Divide the candy so that each student/group has about 30 pieces of 3–6 different colored candy and place them in a small, plastic bag. Copy and cut apart enough pollutant strips for each bag. Place one strip inside each bag.

Procedure

1. Each bag of candy represents a watershed. Open your bag of candy and separate the candies by color.
2. The candies represent different kinds of pollutants associated with various land uses that may be found in a watershed.
3. Using the list of pollutants in the bag, assign a pollutant to each color of candy. If you have more colors than pollutants, make the extra colors "harmless" bacteria.
4. In your science journal, create a key indicating what each color represents.
5. Use graph paper to create a bar graph of the pollutants found in your watershed.
6. Be sure to label the x-axis with the names of the pollutants and the y-axis with numbers.
7. Title your graph and add the pollutant color key from step 5.
8. Ask for the "Land Use Table," and, based on the pollutants that were found there, determine what activities are occurring in the watershed.
9. Classify the watershed as agriculture, construction or forestry, urban, mining, or wastewater.

Conclusion

1. How are watersheds different from one another?
2. What can a scientist learn from studying the kinds of pollutants found in a watershed?
3. How might these pollutants change an ecosystem?

Extensions

1. Contact your state geological survey office or local zoning office to obtain a land use map for your area. Determine how the land in your area is used. What kinds of pollutants might be a problem?
2. Visit the United States Geological Survey's (USGS) web site at *http://www.usgs.gov/* to learn about water use, land use, and much more about your state. Just click on "USGS Information by State" in the bottom right "Popular Topics" box.
3. Read a story about life in pioneer times. Draw a picture of the land as it might have looked 100 years ago. Write a story about how the land was used at that time. Tell the story of the changes in the land through the years until you reach the present day.

Pollution Perils

Pollutant Strips

sediments, nitrates, ammonia, phosphate, pesticides, bacteria	sediment, pesticides, ash	bacteria, nitrates, phosphates, chlorine, organic waste
sediment, heavy metals, acid, nutrients	oil, gas, antifreeze, nutrients, pesticides, paint	

Land Use Table

Land Use	Activities	Pollution Problems
Agriculture	cultivation, pest control, fertilization, animal waste management, weed control	sediments, nitrates, ammonia, phosphate, pesticides, bacteria
Construction and Forestry	land clearing, grading, timber harvesting, road construction, fire control, weed control	sediment, pesticides, ash
Wastewater Disposal	septic systems, laundry, personal hygiene, dishwashing, restaurant waste	bacteria, nitrates, phosphates, chlorine, organic waste
Mining and Industry	dirt, gravel, mineral excavation, chemical cooling, waste products, manufacturing	sediment, heavy metals, acid, nutrients
Urban storm runoff	automobile maintenance, lawn and garden care, painting, rain runoff from blacktop	oil, gas, antifreeze, nutrients, pesticides, paint

Pump Away

Purpose

To see what happens to groundwater reserves when more and more water is pumped out

Materials

gravel
rectangular, clear plastic container
soil
watering can
tap water
4 spray pumps
stopwatch or clock with a second hand
metric ruler

Procedure

1. With a partner, place a 7.5-cm layer of gravel in the bottom of the clear container.
2. Cover with a loose layer of soil.
3. Create an aquifer by using a watering can to "rain" on the container until it holds at least 5 cm of groundwater. See diagram 1.
4. With an erasable marker, mark the level of water in the aquifer (container).
5. With a rubber band, attach a small piece of a paper coffee filter to the open end of each spray pump. See diagram 2.
6. Pretend a family builds a house on one part of your land.
7. Place the tube part of the spray pump into the groundwater in the gravel. Start pumping. See diagram 3.
8. Notice what happens to the level of groundwater. Measure and mark the level of water in the aquifer.
9. Record your findings in your science journal.
10. Use the watering can to make it "rain" for 15 seconds, thus recharging the aquifer.
11. Wait 2 minutes and measure the level of water in the aquifer. Record your findings.
12. Pretend a housing development goes in. Now you will need to add three more pumps.
13. Have your partner help you spray all four pumps at once.
14. Observe what happens to the groundwater now. Measure the new level of water in the aquifer.
15. Record your observations in your science journal.
16. Once again allow it to "rain" on your aquifer for another 15 seconds.
17. Measure the level of water in the aquifer.

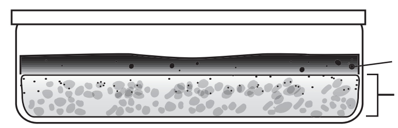


Diagram 1

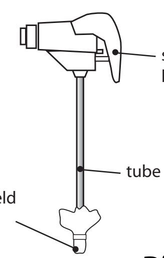


Diagram 2

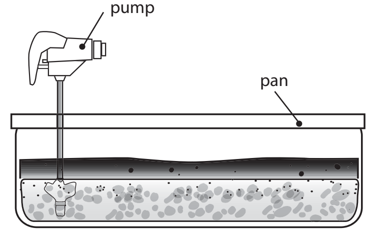


Diagram 3

Conclusion

1. How much water is used from the aquifer when only one pump is used?
2. How much water is used from the aquifer when four pumps are used?
3. Compare the amount of water that is recharged to the aquifer after each rain. Is the aquifer fully recharged the last time?
4. What can we learn about groundwater use from this experiment?
5. How does this experiment relate to the information Jacob shared about the Albuquerque Aquifer?

Extension

Contact your local water department. Arrange for a guest speaker to come to your classroom. Find out where your water comes from. Does your city depend on groundwater, a reservoir, or individual wells? Ask about the kinds of tests that are done on the water to ensure water purity.

Shower Saver

Problem

To construct and calibrate a shower timer that can help save water.

Materials

- 4 large, same-sized plastic cups
- 1 pushpin
- 4 small paper clips
- 4 30-cm pieces of string
- 1 large bowl or bucket
- permanent marker
- stopwatch
- metric measuring cup
- water
- science journal

Background

Over 50% of all residential water usage occurs inside the home. Approximately 30% of that water usage comes under the category of "personal hygiene," which includes baths, showers, and toothbrushing. The average shower uses 19 L (liters) of water for each minute the water is running. Most people take a 4- to 8-minute shower. To conserve water, a 4- to 5-minute shower is recommended.
NOTE: *To save time in this experiment, only 200 mL of water is used in each trial.*

Procedure

1. Fill one of the cups with water but do not let it overflow.
2. Pour the water into a metric measuring cup and read the amount. Record below and in your science journal the total amount of water the cup can hold (its volume).
3. Using a pushpin, poke a hole in the bottom of a plastic cup.
4. Hold the cup over the bucket and pour in 200 mL of water. See diagram 1.
5. Using a stopwatch, time how long it takes for the cup to drain. Note: There will always be a small amount of water left in the cup.
6. Record the time (in seconds) in the Flowchart below.
7. With a new cup, poke 2 holes in the bottom by using a pushpin.
8. Repeat steps 2–4.
9. Repeat steps 2–4 for cups with three and four holes.
10. To find the flow rate for each cup (in mL per second (mL/sec), divide the volume (200 mL) by the number of seconds it took for the cup to drain.
11. Divide the total volume of the cup by 200 mL and record the number of 200 mL amounts per cup below. For example, in a cup that has a total volume of 600 mL, there are three 200-mL amounts: (600 divided by 200 = 3).
12. Multiply the answer by each of the flow rates and record in the Flowchart.
13. Look at your data and find the cup that is closest to taking 4 minutes to drain. This cup is your shower timer.
14. In your shower timer cup, poke four equally spaced holes just under the top rim of the cup.
15. Insert a paper clip in each hole.
16. Tie a string to each of the paper clips.
17. To hang the cup in the shower, tie the strings together at the top. See diagram 2.
18. The next time you are ready for a shower, use your shower cup to help you conserve water. When the cup is almost empty or drips very slowly, your shower is over.
    Optional: *The following can be used to show proportions and to help students extrapolate information.*
19. Plot the data from the 1-hole cup on the graph below.
20. Use a straight edge to draw a line from "0" to the plotted point and beyond.
21. On the y-axis, locate the total volume of the cup.
22. Use your finger or a straight edge and follow across the graph until the line you drew in step 20 meets the line you are tracing for total volume. Plot a point.

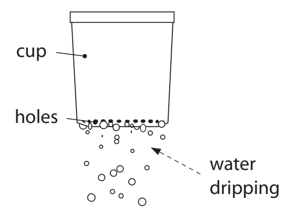


Diagram 1

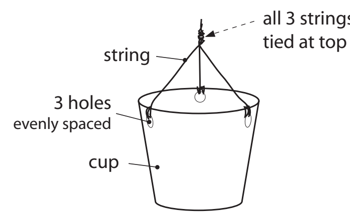


Diagram 2

Shower Saver (concluded)

23. Follow the point you plotted down to the x-axis (Time) and determine how many minutes it would take for the cup to empty. Record in your science journal.
24. Create graphs for each of the other cups with different numbers of holes and repeat.

Flowchart

Cup	Flow Time in Seconds	Flow Rate (FR) 200 mL/ Seconds = mL/sec	Flow Time (FT) #mL x FR = FT
1 hole and 200 mL water		mL/ sec	
2 holes and 200 mL water		mL/ sec	
3 holes and 200 mL water		mL/ sec	
4 holes and 200 mL water		mL/ sec	

Total Volume of Cup: ________ divided by 200 mL = _____ number of 200 mL per cup

Optional Graph:

Conclusion

1. Why is it important to limit the amount of water used for showering?
2. If your average shower uses 19 L of water for each minute the water is running, how much water is used while your shower clock drains?
3. How could you expand the use of a water clock to help save water in other places around your house?

Extensions

1. Using the Internet, list ways that you can conserve water in your home. Trace your hand onto sheets of construction paper and cut along the outline. Write one way to conserve water on each paper hand. Share your conservation ideas with the class and post the hands on a bulletin board around a picture of our Earth. For conservation ideas, visit the "Research Rack" in the tree house on the NASA SCI Files™ web site *http://scifiles.larc.nasa.gov*
2. Keep a water use record. Every time you use water for any purpose, write it down. Figure out how much water you use in a day or week. Use that number to calculate the amount of water you use in a year. Locate charts online and tell the average amount of water that everyday activities use: For example,
   a. flushing toilet – 19 L
   b. brushing teeth (water running) – 7 L
   c. dishwasher – 75 L
   d. dish washing by hand (in sink with stopper) – 37 L
   e. load of laundry – 152 L
   f. shower/bath – 19 L/minute while the water is running

Metric Olympics

Problem

To practice using metric measurements

Teacher Prep

Set up an Olympic station for each event: javelin throw, discus throw, saturated sponge, and paper towel run. For the javelin and discus throws, you will need an open area with a "start" line marked on the floor for each. For the paper towel run, cut paper towels lengthwise into 3-cm strips and use a permanent marker to mark 2.5 cm from the bottom of the glass. For better organization, number each station and have the students number off 1–4. Students will begin by going to the station that corresponds to their number, and rotate to the next higher number when finished. For example, number 4 will go to number 1. Multiple setups for each station will also help the competition go faster. For a better understanding of each event and to help students with estimating, demonstrate each event.

Materials

- sponge
- 2 large bowls
- metric measuring cups
- straws
- paper plates
- meter sticks
- paper towels
- pencil
- tape
- food coloring
- tall clear glass
- permanent marker
- stopwatch or clock with a second hand
- pen
- metric ruler

Procedure

1. Discuss each event and predict the distance or amount you will throw or measure.
2. In the Olympic Chart, use a marker or pen to record your estimation for each event. You may not change your estimation unless you have your teacher or adult initial your change.
3. Javelin Throw
   a. Stand with toes touching the start line and throw a straw (javelin) as far as you can.
   b. Measure the distance the straw traveled.
   c. Record the distance under the "Actual" column in the Olympic Chart.
4. Discus Throw
   a. Stand with toes touching the start line and throw a paper plate (discus) like a Frisbee® as far as you can.
   b. Measure the distance from the line to where the discus landed.
   c. Record the distance.
5. Saturated Sponge
   a. Place the sponge in the bowl of water and let it soak until it is saturated.
   b. In your right hand, hold the wet sponge over the dry bowl and squeeze it as hard as you can, using only your right hand.
   c. Pour the squeezed water into a metric measuring cup and record the volume of water.
   d. Repeat with the left hand.

Metric Olympics (concluded)

6. Paper Towel Run
   a. Tape one end of a paper towel strip to the middle section of a pencil.
   b. Fill the glass to the marked line with water.
   c. Add 2–3 drops of food coloring to the glass.
   d. Lay the pencil on top of the glass so that the bottom of the paper towel is immersed in the water.
   e. After 10 seconds, remove the paper towel strips.
   f. Measure the distance the water traveled up the paper towel strip and record.
7. Calculate the difference between your predictions and the actual distance. Record on chart.
8. Add the prediction, actual, and difference columns. Post your totals on a class chart.
9. Determine a winner of the Olympic games by finding the person who has the lowest "Difference" score.

Conclusion

1. Did using the metric system make it more or less difficult for you to predict results? Explain.
2. Why would scientists prefer the metric system of measurement?
3. What are some common household products that come in metric units?
4. How did units of measurement influence the water problem investigated by the tree house detectives?

Extensions

1. Using metric units of measurement, practice measuring everyday items around your home or school.
2. Create chart and post daily temperatures in both Fahrenheit and Celsius. If your thermometer does not have both scales, use an online metric conversion tool.
3. Read a story about using metric measures. You may look for one in the resource list or check with your local librarian.
4. Calculate your percentage of error.

Olympic Chart

Event	Prediction	Actual	Difference
Javelin Throw	cm	cm	cm
Discus Throw	cm	cm	cm
Saturated Sponge	mL	mL	mL
Paper Towel Run	cm	cm	cm
Totals			

Answer Key

Giving Water the Treatment

1. We must recycle water that has been used or exposed to natural pollutants because water is a limited resource on Earth. Recycling also helps make water safe to drink.
2. Alum dissolves in the water, forming sticky particles that attach to suspended dirt particles floating in the water. These particles become heavier than the water and sink to the bottom.
3. Chlorine is added to kill bacteria and other harmful microorganisms.
4. Most water that reenters the water cycle at some point, as either surface water or groundwater, can be reused when it is treated.

Pollution Perils

1. Answers will vary, but might include that some watersheds are very large, while others are very small. Some watersheds include brackish water or saltwater; others are freshwater only.
2. Scientists can determine what kinds of activities or land uses were probably causing the pollution. When a they find a contamination source, scientists can develop methods to prevent future pollution.
3. Pollutants may change the ecosystem by killing plants or animals, causing animals to move away from the area, or by chemically breaking down the soil and rock in an area.

Pump Away

1. Answers will vary. Students should measure the depth of the water table.
2. Answers will vary, but results should indicate that a more significant amount of water was used than with a single pump.
3. The aquifer should be fully recharged (or nearly so) after its use by only one pump, ; however, the same amount of "rainfall" will not recharge the aquifer to its original volume after several pumps have used the water.
4. Although groundwater can be recharged, it may not always be recharged at the rate of use. It is important for geologists to understand how much water is available in the groundwater table and how quickly the aquifer can be recharged.
5. In Albuquerque, geologists incorrectly surveyed the aquifer, and the water use that was approved for the area quickly depleted the too small aquifer. Because aquifers are underground and not easily measured, scientists have to use what they know about rocks and soils in an area to estimate the size an aquifer should be.

Shower Saver

1. Showering and other personal hygiene tasks account for about 30% of water used inside the home. Water conservation in the home can reduce overuse significantly.
2. Answers will vary, depending on the time required for the shower clock to drain. If the shower clock runs out at 4 minutes, you will have used approximately 76 L of water for your shower. (Number of minutes x 19 L).
3. You could make a shower clock for things like brushing your teeth, hand washing, and so on.

Metric Olympics

1. Answers will vary depending on familiarity with the metric system.
2. Metric measurements are easy to use because they are based on units of ten. They are also more accurate than standard units of measure because the units are divided into smaller sections than standard units, allowing scientists to be more precise.
3. All packaged foods have the metric measurement listed on the packaging. However, soda, bottled water, and juices are commonly referred to by their metric measurement. For example people often say, "a 2-liter bottle of soda." Some states also sell gasoline by the liter.
4. When IM Lissning read the measuring tape, she accidentally read the standard unit side (feet) instead of the metric side (meters). She thought the water table had dropped considerably because the number was much larger than she expected.

Answer Key (concluded)

On the Web

Adaptations

1. Adaptations are the physical traits that help a living organism survive in its natural habitat.
2. Climate and habitat conditions are sometimes harsh. The plants and animals may be exposed to conditions such as extreme heat or cold, drought or flood, winds, and heavy snowfall. The living things that make their homes in these conditions are suited to the conditions because of physical adaptations.
3. People have the ability to solve problems and adapt, when necessary, to environmental changes. Human beings can solve problems as an adaptation to their environment. We can learn to create conditions that help us survive.

Water Bodies

1. Answers will vary.
2. Most of the water is stored inside the cells of the organism.
3. The plant absorbs the water through its roots or leaves and stores it in the cells of the fruit or stem. When animals, or human beings, eat plants, they take in stored water. Some desert animals never actually drink water other than that stored in succulent desert plants.