Lesson 3

Water Ups and Downs

What is the water cycle or hydrologic cycle?
Name a body of water (stream, river, brook) that runs through your town or city?
How are clouds and rivers connected in the water cycle?

GOAL To understand that water is a cycle that connects the water, land and atmosphere.

OBJECTIVES Students will:

- ✓ identify different components of the water cycle and how they are connected
- ✓ create a simulated water cycle to observe
- ✓ relate the water cycle to where they live

MATERIALS **water cycle diagram or poster, ball, oak tag or cardboard on which to copy water connections words or cardboard, plastic soda bottle, ice, sand, construction paper, crayons or markers, pencils, permanent marker, lamp (optional)**

CORE CURRICULUM CONTENT STANDARDS

- **Language Arts 1 (9,10,12)**
- **Science 1 (1,2,4,7), 8 (1 - 3,6), 9 (2,8)**
- **Social Studies 10(1)**

VOCABULARY **evaporation, atmosphere, condensation, transpiration, precipitation, run-off, surface water, ground water**

PROCEDURES

Elicit response from students with the following question(s):

1. Have you ever been out in the rain? Do you know where rain comes from? Elicit responses (*clouds, sky, etc*.) Ask if they are aware of where the water goes after it falls on the grass, on the surface of the parking lot, etc. (*Elicit responses of where it might flow – soil, storm drains, rivers.*)
2. Explain that this is part of the water cycle and special "science words" are used to describe this process or cycle.
3. Show poster or picture of water cycle. Draw cycle on board if picture or poster is unavailable to introduce term *hydrologic or water cycle*.
4. Discuss with students that Earth's surface water or rain is recycled among the plants, animals, and atmosphere in a process known as the hydrologic or water cycle. The water cycle refers to the movement of water through the environment by the processes including evaporation and condensation. The heat from the sun causes the water to evaporate into the atmosphere, and then precipitation in the form of rain, snow, sleet, etc. brings it back down to the earth's surface. Drawings and/or acting out the processes

can also help to "depict" the water cycle.

5. Water comes down to earth in the form of rain or other precipitation. Water runoff flows onto surfaces such as mountain or ridge tops in rural areas or parking lots, parks, or streets in more urban areas.
6. Explain that this runoff water may remain on land as surface water in bodies of water, such as lakes, ponds, rivers, oceans, etc. or may seep below the surface water into what is termed *groundwater*. Groundwater is below the soil that our feet stand on.
7. Water is also recycled by plants through the process of transpiration. Water is sucked in from ground water by the roots of plants, up the stem or trunk, to the branches, to the leaves and out through the pores (called stomata).
8. Explain to students that they will participate in an activity that demonstrates that the hydrologic cycle is a process that is connected. (*Instructor may copy water words below on oak tag or glue words on pieces of cardboard prior to beginning lesson.*) Students receive a card that has a particular word(s) relating to the water cycle and directions for who they may roll the ball to. Examples of words written on cards are: clouds, precipitation, plants, condensation, evaporation, ocean, river, etc. Have students sit in a circle. Give a ball to the student who will begin the activity. The student rolls the ball to a student that has a card with a word relating to the water cycle that connects the previous word in sequential order. For example, if the first student holds the card with the word *cloud* on it, then he/she may roll the ball to the person that holds a card with the word *precipitation* or *rain.* Or if the first student begins with a card that says *ocean*, then the student with the word *evaporation* might follow. Students participate in this activity until connections to the water cycle are made and students understand that the water cycle connects water, land and atmosphere together.
9. Have students relate the generic bodies of water to areas they are able to associate. For example, the *ocean* may be the Atlantic Ocean, *the river* The Connecticut or Farmington River, etc.
10. To demonstrates the water cycle, cut out the bottom of a soda bottle (1 liter). Set aside. Turn the top of the bottle upside down. Place a screen into bottle (at bottle neck) and replace cap. Fill approximately 2/3rds of the way up with sand. Pour approximately 1/3 of a liter of water into the same bottle. Let the water settle. Using the previously removed bottom section of the bottle, insert it in a cup-like manner into the top of the inverted top section (see diagram on following page). Put crushed ice into bottle bottom (which is at the top of the capped bottle). Set the whole model in the sunlight or by a strong lamp to observe. Students may have to wait overnight for process to occur. (*water evaporation, condensation and precipitation)*
11. Have students write what they think will happen- Introduce the word Hypothesis. Have them write down observations- (review what this means) of water cycle. Label water bottle with permanent marker. Use the following terms: ground water, surface water, evaporation, condensation, precipitation.

EXTENSIONS

1) Have students set out rain gauges (upside down liter soda bottles with bottoms removed may be used) in schoolyard. Label, calibrate and mark inches. Have students record data and graph rainfall.

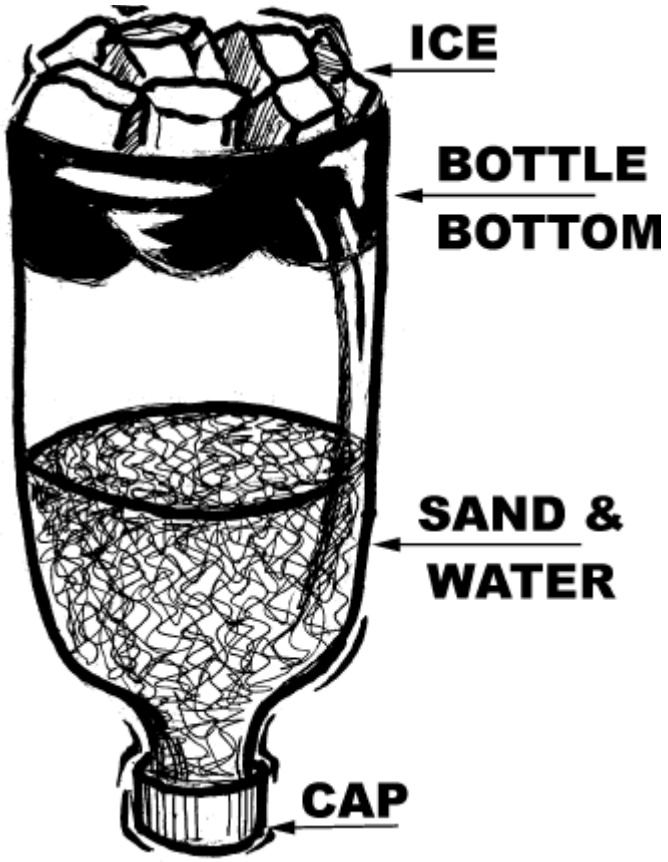
RESOURCES

http://eerc.ra.utk.edu/tnswep/ReuseGuide/watercycle.html. Tennessee Solid Waste Education Project.
http://web.em.doe.gov/soda/cycle.html. U.S. Department of Energy, Office of Environmental Management.

GLOSSARY

atmosphere - the gaseous mass or envelope surrounding the earth
condensation - the process by which a gas or vapor changes to a liquid
evaporation - to covert or change into a vapor
ground water - water beneath the earth's surface, often betewwn saturated soil and rock, that supplies wells and springs
precipitation - any form of water, such as rain, snow, sleet, or hail, that falls to the earth's surface
run-off - rainfall not absorbed by soil
surface water - water above the surface of the ground
transpiration - the act or process of transpiring, especially through the stomata of plant tissue or the pores of the skin

Water Cycle in a Soda Bottle Activity



Procedure:

Cut bottom off a 2L soda bottle, set aside.
Put a screen into the model bottle and put a cap on it.
Fill your model bottle with sand to the 1,000 milliliter mark (approximate, see diagram).
Holding the bottle with your hand or a ring stand, slowly pour in ~200 milliliters of water.
Let the water settle.
Turn the cut out bottle bottom upside down and insert it into the top of the model bottle, so you can add material to the bottle bottom.
Put some crushed ice into the bottle bottom (which is at the top of the model bottle).
Set the bottle in a ring stand in sunlight or beside a strong lamp and observe.
With a grease marker, based on your observations and the descriptions above, label the ground-water model bottle with the following:
Groundwater
Surface water
Evaporation
Condensation
Precipitation
Draw the water cycle on a piece of paper.
Clean up.

WATER CYCLE WORDS

OCEAN	RUNOFF
EVAPORATION	SUN
CONDENSATION	RAIN
CLOUDS	WATER VAPOR
STREAMS	GROUNDWATER
PRECIPITATION	MOUNTAINS
TRANSPIRATION	SOIL
PLANTS	LAKE
TREES	ATMOSPHERE