Upham Woods 4-H Environmental Education Center

The Water Cycle

Program Purpose
The purpose of this program is to introduce students to the components and importance of the water cycle, and to demonstrate how groundwater moves using a model.

Length of Program
1½ hours

Age
Grades 3rd – 8th

Maximum Number of Participants
25

Objectives
After completion of all activities, students will be able to:

- List the nine places on earth where water is found.
- Define the terms cycle and water cycle.
- Explain how energy from the sun powers the movement of water molecules through the water cycle.
- Be able to name and describe the five processes through which water molecules move through the water cycle.
- Simulate the movement of water through the cycle by "becoming" water molecules.
- Write a short story about their movements through the water cycle as a water molecule.
- Define the terms groundwater, aquifer, water table, discharge and recharge.
- Explain how groundwater enters, moves through, and exits the soil.
- Identify four sources of pollution to groundwater.

Preparation
Before the class arrives:

- Obtain the "Water Cycle" kit from the storage room, and set up the "Incredible Journey" game in the exhibit room.
- Make sure exhibit room ("Tree of Life") is available.
- Set up the groundwater model in the exhibit room. Make sure buckets are placed so that water can enter and leave the model.
- Have dyes and syringes on hand for use during the groundwater model demonstration.

Basic Outline
I. Introduction *(5 minutes)*
II. The Water Cycle *(15 minutes)*
III. "The Incredible Journey" game *(40 minutes)*
IV. "The Groundwater Model" *(25 minutes)*
V. Conclusion *(5 minutes)*

Materials
Dry erase board and markers
Water Cycle poster
Nine "Incredible Journey" dice and posters, set up in stations
One "Incredible Journey" sheet per student
Box of pencils
Groundwater Model and related materials, including:
Two lengths of rubber tubing connected with Y-junction
Two buckets
Electric water pump
Extra large jug of water
Wet erase marker
3 bottles of dye
3 syringes

Introduction
Introduce yourself and the class. Explain that the students will be learning about all aspects of the water cycle. They will learn nine places where water is found on earth and the processes by which water moves from place to place. They will play a game where they will "become" water molecules, and write a story about their journey through the water cycle. Finally, they will learn what groundwater is, where it comes from, how it moves, and how it can become polluted.

"The Water Cycle"
Tell the students that they will be helping you to draw a picture of the water cycle on the dry erase board. Start by asking students what are the nine places on earth where water is found. As the students list them off, draw a picture of the nine places with a blue marker. When finished, you should have drawn: Clouds, Glaciers, Rivers, Plants, Groundwater, Soil, Animals, Lakes, and Oceans.
Ask the students what a 'cycle' is. It may be helpful to use an analogy, like a bicycle, which has two wheels that go around and around.

- *A cycle is a process in which any material moves round a system.*

Ask the students then what the term 'the water cycle' means:

- *The water cycle is the process by which water travels to and from the nine places where it exists on earth. The movement of water through the cycle is powered by the energy from the Sun.*

Using the drawing on the dry erase board or The Water Cycle poster, ask the students in what ways does water move through the cycle. The following five processes should be discussed:

EVAPORATION: The process by which water changes from a liquid to a gas. What happens to a puddle on a warm, sunny day? Eventually, the heat from the sun will change the liquid water in the puddle into water vapor, or water in its gaseous state. Steam is an example of water vapor. Water can evaporate from Lakes, Glaciers, Rivers, Soil, Animals, and Oceans.

CONDENSATION: The process by which water changes from a gas into a liquid. As water vapor rises into the atmosphere, it cools and turns back into liquid water. Clouds are just condensed water in the atmosphere, as is fog. Condensation also forms dew in the summer and frost in the winter.

PRECIPITATION: Water that falls from the atmosphere onto the earth's surface. This can take the form of rain, snow, sleet and hail. Precipitation falls from clouds when the condensed water droplets become heavy enough for gravity to pull them down to earth. Precipitation can return water to Glaciers, Rivers, Soil, Lakes, and Oceans.

INFILTRATION: The process by which water enters the Soil and Groundwater by moving in between soil particles. Plant roots can remove water that exists in soil. Groundwater can exit soil and enter rivers, lakes, and oceans. These processes will be discussed more during the groundwater model demonstration.

TRANSPIRATION: The process by which water evaporates out of a plant. Also called evapotranspiration.

"The Incredible Journey"
During this game, students will all become individual water molecules moving through the water cycle. Give each student an "Incredible Journey" sheet and pencil.

Students will start at a station (one of the nine places on earth where water is found). As they move from station to station they will record their journeys (all the places they have visited) on their sheets. When finished, students will each write a story about their personal journeys through the water cycle. Invite students to share their stories to each other. For a complete description of this activity, see the attached "Incredible Journey" lesson from Project WET.

"The Groundwater Model"

Use the attached "Using the Groundwater Model" lesson as a guide when doing the groundwater demonstration. At a minimum, you should define the terms groundwater, aquifer, water table, discharge, and recharge. Potential sources of pollution to show on the model (represented by the colored dyes) are:

- The Leaky Lagoon
- Fertilizer or pesticide applied to grass before a rain
- Motor oil washed from roads into storm drains

Try to involve students as much as possible during the demonstration. Allow students to add dye to the piezometers and to various parts of the model to represent pollution.

Conclusion

Ask students to define the water cycle, name the places where water is found and the processes by which water moves through the cycle. Ask students what groundwater is, how it enters and exits the soil, why it is important, and how it can be polluted.

REFERENCES

"The Incredible Journey," *Project WET Curriculum and Activity Guide,* p. 161.

"Using the Groundwater Model," Upham Woods Lesson plan, adapted from original version by Chris Mechinech, UW- Stevens Point Groundwater Center.

The Illustrated Dictionary of Ecology and Plant Life, Merilyn Holme, ed. 1993. ISBN 1-85737-002-3.