

# GROUNDWATER and the WATER CYCLE

## Learning objectives:

1. List the steps of the water cycle in correct sequence.
2. Define appropriate groundwater terms.
3. Explain where groundwater is found.
4. Identify sources of groundwater pollution and possible solutions.

## Water Cycle/Hydrologic Cycle Background Information:

Seventy-five percent of our earth's surface is covered with water. The water is not only located on the surface of the ground (**surface water**), but under the ground as well (**groundwater**). All of earth's water is the same water that has been recycled through the **hydrologic cycle** since the formation of earth. The earth continuously moves water through **evaporation, transpiration, condensation, and precipitation**. The four-forms of precipitation being rain, snow, sleet, and hail. Water is the most powerful force for spreading pollution, because its unique properties are sticking, pulling, dissolving, and carrying pollutants through the watershed which is continuously recharged by the hydrologic cycle. Because the hydrologic cycle is continuously moving water through the **watershed** (over and under the ground), large amounts of pollutants that are dumped or poured onto the ground are carried into water bodies.

## Groundwater Background Information:

Every day, people all over the world depend on a hidden resource—groundwater. Only 3 percent of the earth's water supply is fresh water and almost 2 percent of that is groundwater. In fact, more than 50 percent of the people in the United States get their drinking water from groundwater, including almost all who live in rural areas.

There is really nothing mysterious about groundwater. We just can't see it like we can see a pond, a stream, or the ocean. This water collects below the earth's surface in **aquifers**, (spaces between soil and rock particles). It is also found in cracks and crevices and inside **porous** rocks.

The top surface of groundwater is called the water table. When the water table is high enough, groundwater comes to the surface naturally in springs, lakes, ponds and rivers, and it can also be brought to the surface by drilling wells. But the top level of groundwater (the water table) is usually underground. Groundwater is a vital part of the water cycle and is replenished by rainfall. The amounts of groundwater in different areas of the world vary and the amount at any one place can change due to prolonged drought, heavy withdrawal for human use, or other factors.

Groundwater quality is generally better than that of surface water because it is not as readily exposed to **pollution** sources. Also, the movement of groundwater through various layers of soil and rock **filters** out many **impurities**. However, some groundwater can be polluted by **pesticides**, chemicals, **landfill leachate**, and other materials that seep into groundwater supplies.

### Terms:

**Aquifer:** an underground layer of unconsolidated rock, gravel or sand that is saturated with usable amounts of water.

**Filter:** to remove contaminants by using a porous material such as paper or sand.

**Groundwater:** water that infiltrates into the earth and is stored in usable amounts in the soil and rocks below the earth's surface; water in an aquifer.

**Impurities:** substances that contaminate another substance.

**Pollution:** contaminants in the air, water, or soil that cause harm to human health or the environment.

**Porous:** having pores or cavities that can hold substances such as water.

**Water cycle:** the cycle of the earth's water supply from the atmosphere to the earth and back which includes precipitation, transpiration, evaporation, runoff, infiltration, and storage in water bodies and groundwater.

**Water table:** the top of the water surface in the saturated area of an aquifer.

**Preparation:**

Construct model of the water cycle. Use poster board to make clouds and raindrops. Hang clouds with raindrops below them (use string or fishing line). In a clear container, such as a plastic sweater box, create "the ground" area. From the bottom up, layer the following: clay, gravel, or small rock, a plastic sandwich bag filled with water, layer of soil, small plastic bowl filled with water (sink the bowl into the soil so the top will be at surface level to simulate a pond or lake), grass, trees, and other figures.

**Procedure:**

1. Pour a small amount of water into the water cycle model. Ask students where the water went. Explain that since it soaked into the ground and will seep into underlying rock formations it is called groundwater.
2. Explain that the top surface of the groundwater is called water table.
3. Ask students which they think would be most easily polluted: surface water (Lakes, ponds, etc) or groundwater.
4. Point out the importance of groundwater as part of the water cycle.

**Activities:**

**A. Water Cycle & Groundwater**

1. Discuss the steps in the water cycle. Refer to model.
  - a. Have students draw a picture and label the sequences, beginning and ending with evaporation.
  - b. After students complete the activity, list the steps on the board as they call them out.
  - c. Using the poster of River Town from the Tools for Study, have students identify the 13 potential sources of water pollution.
  - d. Build a Water Cycle on page 15.
  - e. Have students complete the Water Cycle Word Search on page 17.
  - f. Have students take the Water Quality Steward Checkpoint 2 quiz on page 17.
  - g. Have students build a percolator on page 18 & 19.
  - h. Have students build and eat an edible aquifer on page 21.
  - i. Have students complete the Water Wise Word Scramble review on page 22.
  - j. Have students complete the Water Quality Steward Checkpoint 3 quiz on page 22.  
(Answer key on page 94.)