

What can we learn about water at the pond?

Background

Please see the information on Water Quality Testing provided in the *4-H Wildlife Stewards Project Handbook*. Also, see *Watershed Stewardship: A Learning Guide* (EM 8714), Oregon State University Extension Service; for price and ordering information, see the online catalog (<http://eesc.oregonstate.edu>) or fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).

The chemical formula of a water molecule is H_2O . This means there are two atoms of hydrogen attached to one atom of oxygen. The hydrogen and oxygen in the molecule are attached to each other by very strong bonds called **covalent bonds**. There are also weaker bonds between the oxygen and hydrogen of adjacent water molecules. This loose arrangement of molecules gives water its fluid nature and other remarkable properties.

When water freezes at 32° Fahrenheit (F) or 0° Celsius (C), it changes from a liquid to a solid. Water boils at 212°F or 100°C.

Learners probably know that when water boils, it produces steam. If they participated in the Sun Power lesson in Unit 1, they know that water can evaporate from a cup of water with a temperature below 100°C. In the process of evaporation, the warmed water is changed from a liquid to an invisible gas called **water vapor**. As the water warms, its molecules move further apart from each other. Another way to say this is the water becomes less dense. When water vapor condenses to liquid water, it is becoming more dense. The **water cycle** is the process of liquid water changing to a gas and then back to liquid water.

Oregon benchmarks

Benchmark 1

- Describe changes that occur in matter.

Benchmark 2

- Identify substances as they exist in different states of matter.
- Describe the ability of matter to change state by heating and cooling.

Rosa Raindrop's Water Cycle

FYI

The water—or **hydrologic**—cycle is an endless process in which water is circulated around the surface of the earth through soil, plants, animals, and the atmosphere. The amount of water moving through the cycle has been approximately the same throughout 3.5 billion years. On average, a single water molecule is evaporated once every 5,000 years and has moved through the cycle about 700,000 times.

Materials

Part 1

- One set of Water Cycle Activity cards (Appendix II). There are 21 main-heading cards. If you are working with more than 21 learners, you may assign up to 7 additional cards as follows:
 - ◆ “Water vapor evaporating from the ocean” (cards 2b, 2c, 2d, 2e), for one to four additional participants
 - ◆ “Rain” (card 4b), for one additional participant
 - ◆ “Soil infiltration” (card 8b), for one additional participant
 - ◆ “Slushy melting snow” (card 13b), for one additional participant
- Overhead transparency: A Basic Water Cycle (Appendix III)
- Overhead transparency: Rosa Raindrop’s World Water Tally (Appendix III)
- Overhead transparency pen, nonpermanent ink
- Blackboard and chalk or flip-chart with pens

Part 2

- *4-H Rosa Raindrop Water Cycle Board Game* (4-H 3804), one per four learners
- Dice, one per game board
- Playing pieces. Corks work well; four per game board

Preparation

Order copies of the *4-H Rosa Raindrop Water Cycle Board Game* (4H 3804) from the Oregon 4-H Clover.

Photocopy the Water Cycle Activity Cards from the masters in Appendix II onto card stock. Make the overhead transparencies listed above from the masters in Appendix III.

Procedure

Part 1

Place the overhead transparency “A Basic Water Cycle” on the projector. Pass out the first seven Water Cycle cards. These are cards 1, 2a, 3, 4a, 5, 6, and 7. As you hand a card to each learner, have him or her read the FACT on the card to the class, then take his or her place in the Basic Water Cycle circle. When the first seven learners are in place, ask them to read again the title of their card to the group. Ask the remaining learners if there are any ways not mentioned that water exists or moves on earth. Record the answers on the board or flip-chart paper.

From the remaining Water Cycle cards (8 through 21), pass out the ones from the answer list learners made first. Add all the remaining cards from the set, and, if needed, cards 2b, 2c, 2d, 2e, 4b, 8b, and 13b. As you hand each card to a learner, have him or her read the FACT on the card to the group, then take his or her

National Science Education Content Standards

Grades K–4

- Properties of objects and materials
- Evidence, models, and explanation

Grades 5–8

- Properties of objects and materials
- Evidence, models, and explanation

Content objectives

Learners will be able to do the following:

- Name the three forms of water found on earth (solid, liquid, gas).
- Demonstrate the water cycle.





place in the Water Cycle circle. The learner with card 21 (Rosa Raindrop) joins the demonstration after all the other learners have taken their places in the Water Cycle circle.

Put the “Rosa Raindrop’s World Water Tally” overhead transparency on the overhead projector. Ask Rosa Raindrop to travel around the water cycle, pausing as each learner again reads his or her card’s title. At each location with a world water supply percentage listed, Rosa “collects” this water. Use an erasable overhead pen to record the water supply percentage in each blank on the World Water Tally.

Rosa Raindrop’s World Water Tally

Lakes	————— 0.017%	Rivers/streams	————— 0.0001%
Oceans	————— 97.54 %	Ice caps/glaciers	——— 1.81%
Soil moisture	——— 0.005%	Atmospheric water	— 0.001%
Groundwater	——— 0.62%		

When Rosa has completed one cycle through the Water Cycle, ask learners to raise their hand if they represent a part of the water cycle in which water:

- Is a gas
- Is a liquid
- Is a solid
- Moves
- Is fresh
- Is salty. Remember, only one learner, the ocean, represents salt water. However, the majority of the water on earth is found in the oceans. Remind learners of this using the World Water Tally. They should not be confused by the greater number of learners who represent the many forms of fresh water.
- Which parts of the water cycle take place at the habitat area pond? (Water is lost from the pond by evaporation, transpiration, and absorption by plants. Water is added to the pond by snow, rain, hail, runoff.)
- Because the habitat area pond is an artificial pond, parts of the water cycle probably do not take place there. Ask learners, “Which parts of the water cycle do not take place at the habitat area pond?” (Infiltration of water into soil or percolation from soil, due to the pond liner.)

Part 2

Pass out one *4-H Rosa Raindrop Water Cycle Board Game* to each group of four learners. They also will need one playing piece each and a die for each game. Ask learners to play two or three rounds of the game. Did they travel a different path through the water cycle each time they played?

Extend the learning

Project WILD Aquatic Education Activity Guide: How Wet is Our Planet? A Palette of Fun (4-H 713L): Mural Madness; Scissors Snipping