

WHAT IS THE WATER CYCLE?

UNIT 1: Energy
Lesson 2 — Grade 6
INSTRUCTIONS



Overview

Students play a game modeling the path that water takes through Earth: from the soil to rivers and lakes to clouds to the ocean and so on.

Objectives

On successful completion of this lesson, students will be able to:

- give examples of where water exists on Earth as a liquid, solid, and gas;
- explain the water cycle and demonstrate that water circulates through the crust, oceans, and atmosphere of Earth; and
- describe the processes water goes through as it circulates.

Alaska Standards

Alaska Science Standards / Grade Level Expectations

- [6] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*
- [6] SD1.2 The student demonstrates an understanding of geochemical cycles by identifying the physical properties of water within the stages of the water cycle
- [6] SD3.1 The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth's position and motion in our solar system by connecting the water cycle to weather phenomena

Alaska Cultural Standards

- [E] Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them.

Bering Strait School District Scope & Sequence

- MS Sequence 6.3: Cycling of Matter and Energy
MS sequence 7.9 Water Cycle and Oceans
MS Sequence 8.2 States of Matter



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Materials

- 9 six-sided dice
- Teacher Overhead "Water Cycle"
- Teacher Information Sheet "Water Cycle Movement"
- Student Worksheet "Water Cycle Game"

Student Information Sheets

- "Soil Surface"
- "Plant"
- "River"
- "Ocean"
- "Lake"
- "Animal"
- "Groundwater"
- "Glacier"
- "Clouds"

Multimedia

REACH Multimedia 4-6: "Water Cycle"
Available at: www.k12reach.org

Additional Resources

Glencoe Life Science Ch 20
Glencoe Earth Science Ch 15-16
Glencoe Physical Science Ch 7-8



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Activity Preparation

1. Arrange desks or tables in the classroom as shown in the diagram below, with room to walk between the stations. Place one of the Student Information Sheets and a die on each desk.

Desk Configuration

| | | |
|--------|--------------|----------|
| Animal | Plant | Clouds |
| Lake | Soil Surface | Glaciers |
| River | Groundwater | Ocean |

Whole Picture

The water cycle, or hydrologic cycle, describes the continuous movement of water on earth. The path water takes through the cycle can vary. Water in a river may be taken up by a plant or animal, infiltrate the ground to become ground water, evaporate into the atmosphere or enter the ocean. The amount of time water spends at any one place can also vary. A molecule of water will spend, on average, 20,000 years in Antarctica, several months in snow cover, but only 9 days in the atmosphere.

Energy from the sun drives the movement of water. It takes energy to evaporate water as energy absorbed during evaporation cools the environment. When water condenses it releases energy, warming the environment. The exchange of energy leads to temperature changes.

The amount of water on earth is fairly constant at approximately 332.5 cubic miles. Over 96% of the water on earth is saline and most of that is in the oceans. Of the remaining 4% of freshwater, 68% is found in ice and glaciers. The rest of the water, which people depend on, is found in groundwater, rivers and lakes.

As water transfers from one location to another it can cause erosion, changing the landscape. Depending on the path water takes it can also be purified as it moves through the cycle. Where a molecule will be thousands of years from now is likely to be different from where it is found today. A water molecule coming out of a faucet today could have flowed through the veins of dinosaur thousands of years ago as water moves through the cycle.



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Vocabulary

| | |
|----------------------|--|
| condensation | the change of state from a gas, or vapor, to liquid. When water vapor cools it condenses to form water droplets that produce clouds |
| evaporation | change of state from a liquid to a gas that occurs below the boiling point |
| groundwater | water that is located underground in the porous spaces of rocks and soil |
| infiltration | the downward movement of water from the surface into the soil |
| precipitation | water that falls to Earth's surface in the form of rain, snow, hail, or sleet |
| runoff | draining away of water across the land |
| sublimation | the process of changing from a solid to a gas without passing through an intermediate liquid phase (such as ice and snow to water vapor) |
| transpiration | the release of water vapor from plant leaves |

Activity Procedure

1. Ask students where water exists on Earth and how it gets there. Display the Overhead: "Water Cycle." If needed, introduce the term water cycle. Explain that a cycle is something that repeats over and over. For example, the year is a cycle. The twelve months of the year repeat over and over every year. Water moves on, above and below Earth in a cycle as well. Introduce the vocabulary that describes the process when water moves from one location to another (i.e. evaporation, transpiration, precipitation, etc.). Describe the energy transfers that take place in the water cycle.
2. Explain that students will play a game; they will role play water as it moves throughout Earth. Distribute the STUDENT WORKSHEET: "Water Cycle Game." Divide students evenly among the stations. With a larger class it may be necessary to have students work in pairs.
3. Explain that when the signal is given, students will roll the die at the station. If more than one student is at a station, students will need to take turns rolling the die. Students should read the number on the die and match it to the chart on the sheet on the table. The chart will indicate where to go next. For example, if a student rolls a 3 at the Soil Surface Station, he or she will move to the Groundwater station next.
4. As students move from station to station, they should diagram their paths on their STUDENT WORKSHEETS. Sometimes the chart will indicate that a student should stay at that station. In that case, the student should mark an X on that location on his or her diagram then wait their turn to roll again. By the end of the game, a student may have



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- several X's next to a particular station. At the end of the game, students will share paths with each other.
- On the Data Table they should list what station they were at for the start of each roll of the die and which state (solid, liquid, or gas) the water was in at that station. Once they've rolled the die, students should also complete the "Process" column using vocabulary terms when appropriate, to explain what process the water goes through to move to the next location. For example, when water on the surface flows downward it becomes groundwater. The process of moving is called infiltration. In some instances there is not specific terminology, such as an animal drinking water from a river. Have the students describe what occurs, such as "drinking". When water moves from the ocean to a cloud it would evaporate, then condense into a cloud so students could use two terms, evaporation and condensation, to describe the process. In other cases there will not be any movement so students should write "stayed". It may be helpful to list the vocabulary terms on the board for students to refer back to.
 - Play a mock round to make sure students understand the rules.
 - Indicate that students should begin and assist as necessary. Allow students to play for 15 rolls of the dice.
 - Draw a replica of the blank STUDENT WORKSHEET: "Water Cycle Game" on the board or use the OVERHEAD: "Water Cycle." Invite students to share the path they took. Compare students' paths. Ask if any students followed exactly the same path as another student and why it might be unusual if they did. Ask students if water follows the same path on earth, or many different paths.
 - Ask students to answer the following questions based on the paths that were taken during the water cycle game. List student ideas on the board and discuss as a class.
 - Where can water from a plant go?
 - How does water get to a river?
 - Where can water go from a glacier?
 - How does water get to a cloud?
 - What are some paths water cannot follow?
 - What role does the sun play in the water cycle?
 - What effect does the water cycle have on temperature?
 - If time permits, ask students to total up the number of times they spent at each location. On the board make a chart with the class totals. Ask students what type of graph could be used to represent the data. Have a student make a graph of the data on the board.

Answers

Answers will vary, however students should only illustrate path that are allowed within the rules of the game. The state, solid, liquid and gas of water at each location should be correctly



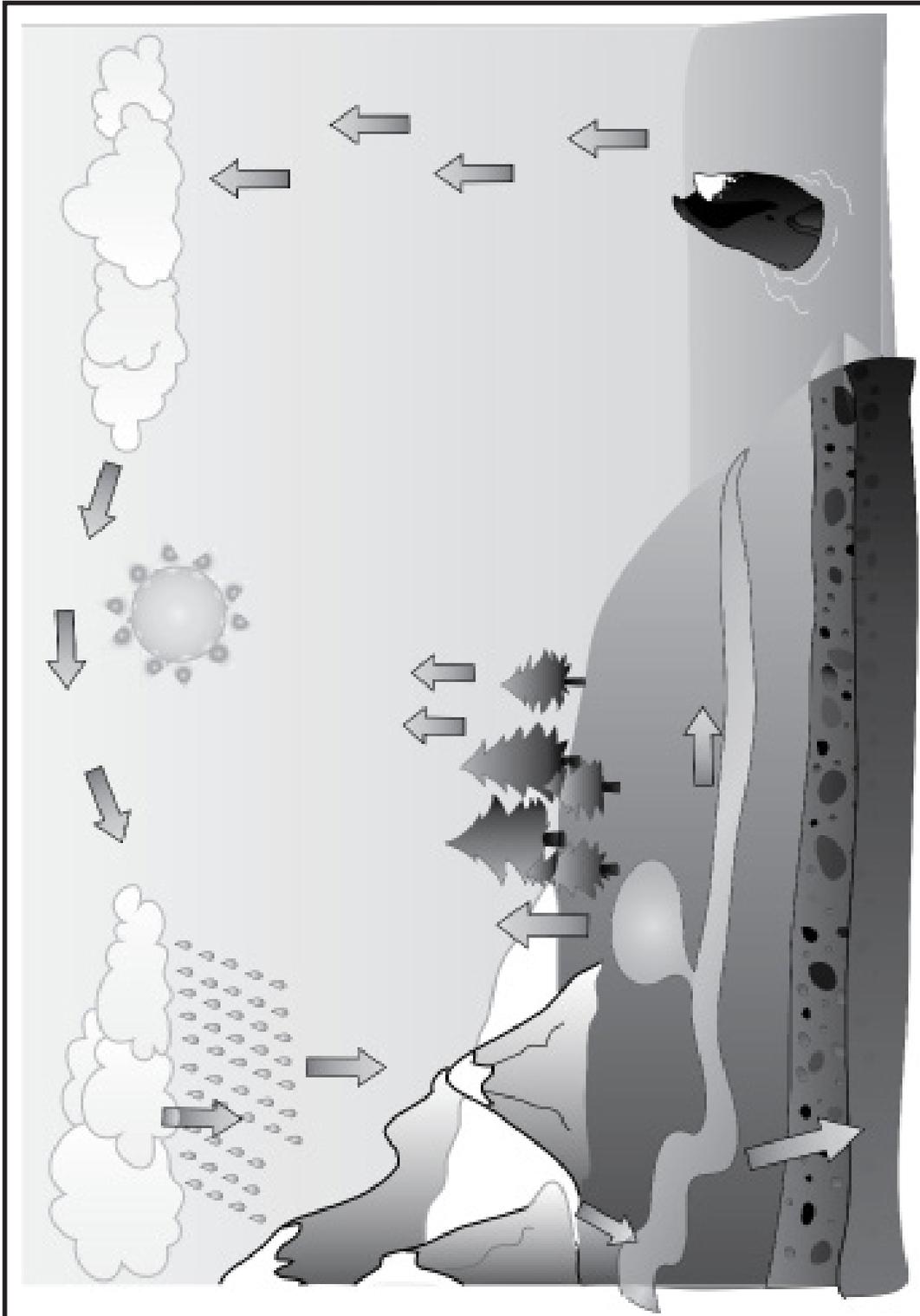
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Student Worksheet: Water Cycle Game

Name _____

1. Chart the path you take during the game on the picture below.



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Student Worksheet: Water Cycle Game

2. List the location at each roll of the dice and list the state the water is in at each location.

| Roll | Location | State of water (solid, liquid, gas) | Process (evaporation, precipitation, stayed in place, etc.) |
|------|----------|--|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |



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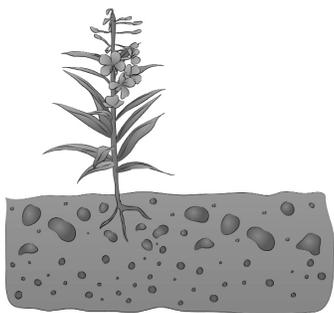


Teacher Information Sheet: “Water Cycle Movement”

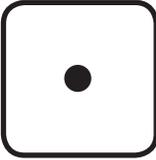
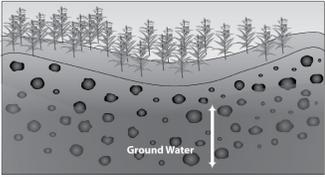
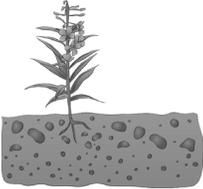
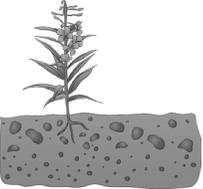
| Location | Moves To | Process of Movement |
|--------------|--------------|---|
| Soil Surface | Plant | The roots of plants absorb water. |
| | River | Water runs off the soil into a river. |
| | Groundwater | Water is filtered through the soil to the ground. |
| | Clouds | Water is heated until it evaporates and forms clouds. |
| | Soil Surface | Water stays on the surface of the soil. |
| Plant | Clouds | Water leaves the plant in the form of water vapor through transpiration and forms clouds. |
| | Plant | The plant uses water. |
| River | Lake | Water flows from a river to a lake. |
| | Groundwater | Water is filtered through the soil to the ground water. |
| | Ocean | Water flows from a river to the ocean. |
| | Animal | An animal drinks the water. |
| | Clouds | Water is heated until it evaporates and forms clouds. |
| | River | Water remains in the current of the river. |
| Clouds | Soil Surface | Water condenses, precipitates, and falls onto the soil. |
| | Glacier | Water falls as snow onto a glacier and becomes part of the glacier. |
| | Lake | Water condenses, precipitates, and falls into a lake. |
| | Ocean | Water condenses, precipitates, and falls into the ocean. |
| | Clouds | Water remains as a water droplet within a cloud. |
| | River | Water condenses, precipitates, and falls into a river. |
| Ocean | Clouds | Water is heated until it evaporates and forms clouds. |
| | Ocean | Water remains in the ocean. |
| Lake | Groundwater | Water is filtered through the soil to the groundwater |
| | Animal | An animal drinks the water. |
| | River | Water flows into a river from the lake. |
| | Clouds | Water is heated until it evaporates and forms clouds. |
| | Lake | Water remains in the lake. |
| Animal | Soil Surface | Animals excrete water through urine and feces onto the soil. |
| | Clouds | Water vapor is emitted by animals through respiration and rises to form clouds. |
| | Animal | The animal uses the water. |
| Ground Water | River | Water filters through the soil to a river |
| | Lake | Water filters through the soil to a lake. |
| | Groundwater | Water stays underground. |
| Glacier | Groundwater | Ice melts and the water filters underground. |
| | Clouds | Ice evaporates through the process of sublimation. The water vapor forms clouds. |
| | River | Ice melts and flows into a river. |
| | Glacier | Ice remains in the glacier. |



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SOIL SURFACE

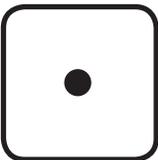
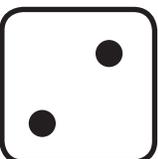
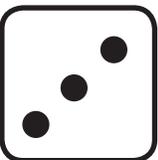
| | |
|--|---|
| <p>1</p>  | <p>Plant</p>  |
| <p>2</p>  | <p>River</p>  |
| <p>3</p>  | <p>Groundwater</p>  |
| <p>4</p>  | <p>Clouds</p>  |
| <p>5</p>  | <p>Soil Surface</p>  |
| <p>6</p>  | <p>Soil Surface</p>  |



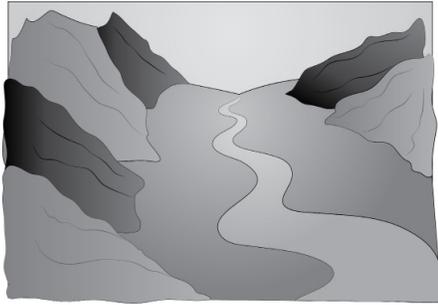
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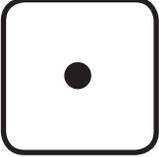
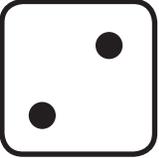
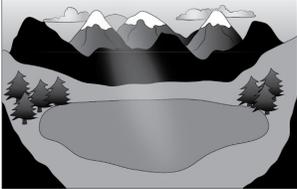
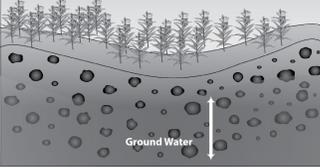
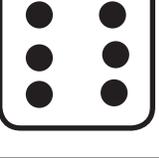
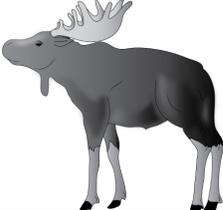
PLANT

| | |
|--|---|
| <p>1</p>  | <p>Clouds</p>  |
| <p>2</p>  | <p>Clouds</p>  |
| <p>3</p>  | <p>Clouds</p>  |
| <p>4</p>  | <p>Clouds</p>  |
| <p>5</p>  | <p>Plants</p>  |
| <p>6</p>  | <p>Plants</p>  |

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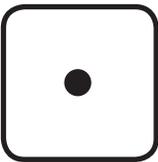
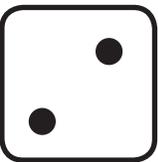
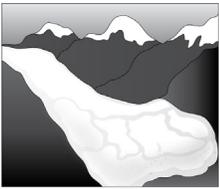
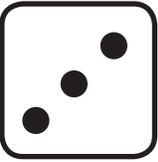
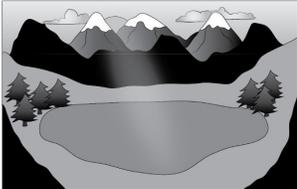
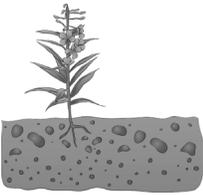
RIVER

| | |
|--|---|
| <p>1</p>  | <p>Clouds</p>  |
| <p>2</p>  | <p>River</p>  |
| <p>3</p>  | <p>Lake</p>  |
| <p>4</p>  | <p>Groundwater</p>  |
| <p>5</p>  | <p>Ocean</p>  |
| <p>6</p>  | <p>Animal</p>  |

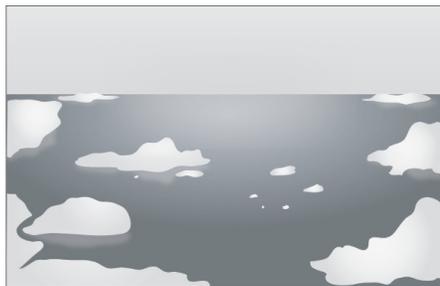
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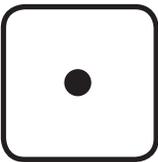
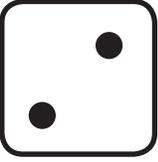
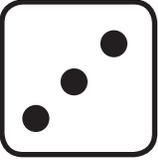
CLOUDS

| | |
|--|---|
| <p>1</p>  | <p>Clouds</p>  |
| <p>2</p>  | <p>Glacier</p>  |
| <p>3</p>  | <p>Lake</p>  |
| <p>4</p>  | <p>Soil Surface</p>  |
| <p>5</p>  | <p>Ocean</p>  |
| <p>6</p>  | <p>River</p>  |

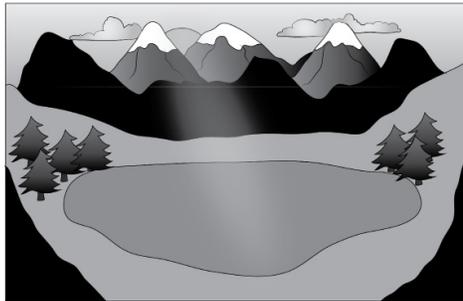
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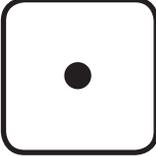
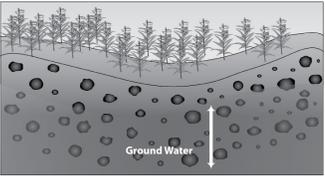
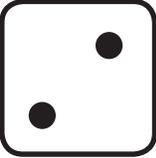
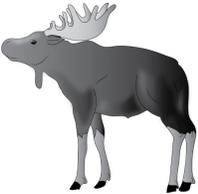
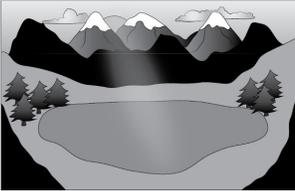
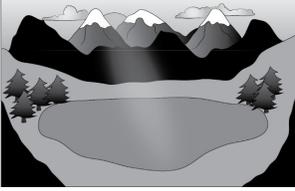
OCEAN

| | |
|--|---|
| <p>1</p>  | <p>Clouds</p>  |
| <p>2</p>  | <p>Clouds</p>  |
| <p>3</p>  | <p>Ocean</p>  |
| <p>4</p>  | <p>Ocean</p>  |
| <p>5</p>  | <p>Ocean</p>  |
| <p>6</p>  | <p>Ocean</p>  |

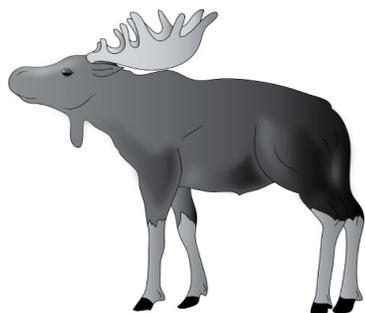
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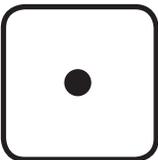
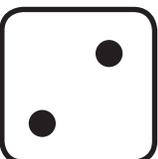
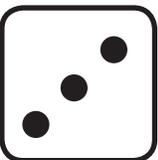
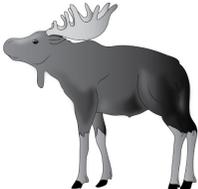
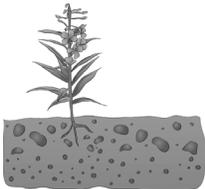
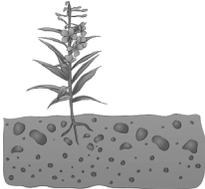
LAKE

| | |
|--|---|
| <p>1</p>  | <p>Groundwater</p>  |
| <p>2</p>  | <p>Clouds</p>  |
| <p>3</p>  | <p>Animal</p>  |
| <p>4</p>  | <p>River</p>  |
| <p>5</p>  | <p>Lake</p>  |
| <p>6</p>  | <p>Lake</p>  |

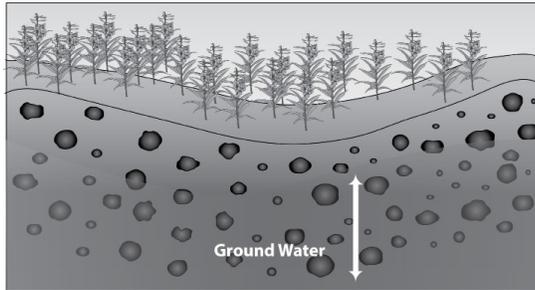
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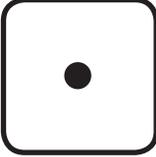
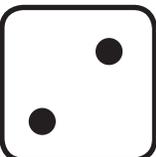
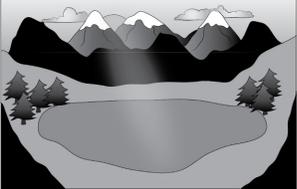
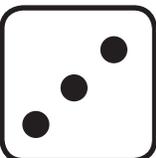
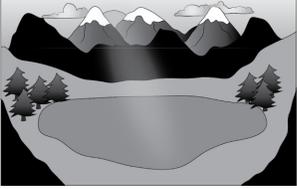
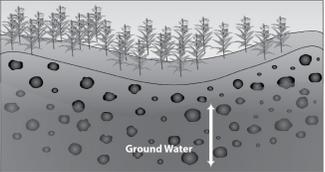
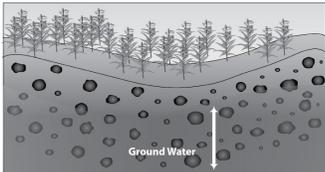
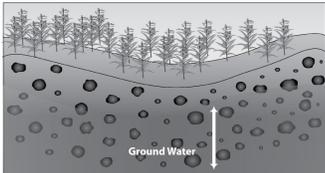
ANIMAL

| | |
|--|--|
| <p>1</p>  | <p>Clouds</p>  |
| <p>2</p>  | <p>Clouds</p>  |
| <p>3</p>  | <p>Clouds</p>  |
| <p>4</p>  | <p>Animal</p>  |
| <p>5</p>  | <p>Soil Surface</p>  |
| <p>6</p>  | <p>Soil Surface</p>  |

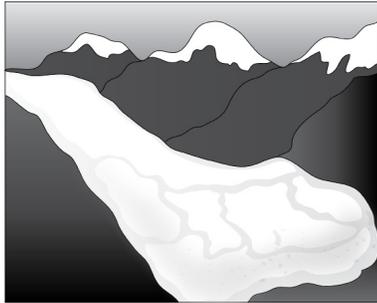
WHAT IS THE WATER CYCLE?



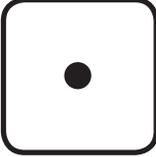
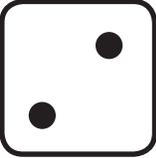
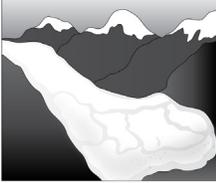
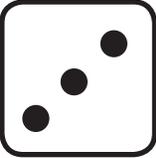
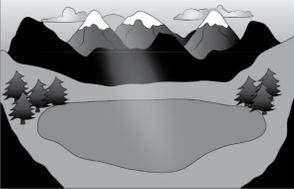
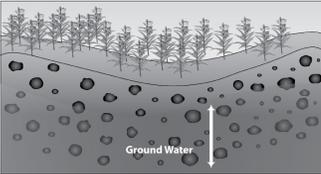
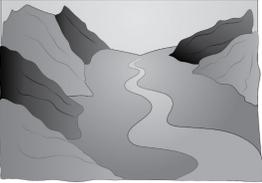
GROUNDWATER

| | |
|--|---|
| <p>1</p>  | <p>River</p>  |
| <p>2</p>  | <p>Lake</p>  |
| <p>3</p>  | <p>Lake</p>  |
| <p>4</p>  | <p>Groundwater</p>  |
| <p>5</p>  | <p>Groundwater</p>  |
| <p>6</p>  | <p>Groundwater</p>  |

WHAT IS THE WATER CYCLE?



GLACIER

| | | |
|--|--------------------|--|
| <p>1</p>  | <p>Glacier</p> |  |
| <p>2</p>  | <p>Glacier</p> |  |
| <p>3</p>  | <p>Glacier</p> |  |
| <p>4</p>  | <p>Groundwater</p> |  |
| <p>5</p>  | <p>Clouds</p> |  |
| <p>6</p>  | <p>River</p> |  |

WHAT IS THE WATER CYCLE?



Teacher Overhead: Water Cycle

