

Bruce Jessop, Fred Marcin  
Fall, 2004

### Water on the Move in the Great Salt Lake Basin

**Abstract:** This lesson explores the water cycle as it relates to the Great Salt Lake basin in Utah. Students will have the opportunity to learn how water moves in and out of the Great Salt Lake Basin.

**Topic:** Water Cycle

**Grade:** 4

**Science Benchmark:**

Matter on Earth cycles from one form to another. The cycling of matter on Earth requires energy. The cycling of water is an example of this process. The sun is the source of energy for the water cycle. Water changes state as it cycles between the atmosphere, land, and bodies of water on Earth.

**Standards and Objectives:** 3040-0301, 3040-0302

Students will understand that water changes state as it moves through the water cycle.

**Objective 1:** Describe the relationship between heat energy, evaporation and condensation of water on Earth

- a. Identify the sun as the source of energy that evaporates water from the surface of Earth.
- b. Compare the processes of evaporation and condensation of water.

**Objective 2:** Describe the water cycle.

- a. Locate examples of evaporation and condensation in the water cycle (e.g., water evaporates when heated and clouds or dew forms when vapor is cooled).
- b. Describe the processes of evaporation, condensation, and precipitation as they relate to the water cycle.
- c. Identify local Utah locations that hold water as it passes through the water cycle (e.g., oceans, atmosphere, fresh surface water, snow, ice, and ground water).
- d. Construct a model or diagram to show how water continuously moves through the water cycle over time.

**Elements of Inquiry:** Classify, Communicate

**New Terms:** Great Salt Lake Basin, drainage basin,

**Intended Learner Outcomes:** Students will explore the properties, position, and motion of water in the water cycle within the Great Salt Lake Water Basin (National Content Standard B) through role-play, hands-on activities, and creative writing in order to better understand the water cycle.

**Time:** 60 minutes

Background Information: The Great Salt Lake receives water from four main rivers and numerous small streams (66 percent), direct precipitation into the lake (31 percent), and from ground water (3 percent). The total average annual inflow to the lake is about 2.9 million acre feet of water.

The main rivers entering the lake are the Bear River from the north, the Weber and Ogden Rivers from the east, and the Jordan River from the south. The drainage basin of the lake covers an area of about 21,500 square miles.

Materials: CD of water music, timer, 7 large pieces of paper for stations, Incredible Journey score sheet for each student, 7 dice

Preparation: Label local Utah places around the room on large pieces of paper as Mountain, Stream, Cloud, Animal, Ocean/Lakes, Plant, and Ground Water. Place station sheets (see attached) at corresponding stations, and label directions on each sheet #1-6. Place dice at each station.

Anticipatory Set: Students should already be familiar with the water cycle and vocabulary terms related to it. Review. Ask, “What are the different places water can go as it moves through and around earth?” and “What does it look like when it is in these different places?” Write responses on the board.

Invitation to Learn: Ask the students to consider what it would be like to take a journey through the water cycle in the Great Salt Lake Water Basin as a water drop! How will they get to different places? What will happen to them along the way?

Procedures: WARM UP-Ask students to identify the different places water can go as it moves through and around earth. Write their responses on the board.

- 1) Tell students they are going to become water molecules moving through the water cycle.
- 2) Categorize the places water can move in the Great Salt Lake Basin into seven stations: Clouds, plants, animals, streams, ground water, mountains. Create station locations around the room.
- 3) Assign an even number of students to each station. (The cloud station can have an uneven number.) Have students identify the different places water can go from their station in the water cycle. Discuss the conditions that cause the water to move. Students should discuss the form in which water moves from one location to another.
- 4) In this activity, a roll of the die determines where water will go. Each student takes a turn rolling the die and then relocates to the next station the die indicates.

- 5) As students begin changing stations they should keep track of their movements on their activity sheet.
- 6) Tell students the activity will begin and end with the sound of a bell.
- 7) After the activity, have students use their travel records to write stories about the places water has been. They should include a description of what conditions were necessary for water to move to each location and the state the water was in when it moved.

Assessment/Closure: Students will show their understanding of the water cycle by writing a story about their “journey” based upon their score sheets. Students share their stories with the class and/or turn them in along with their score sheets. Assessment criteria would evaluate student understanding of water cycle, different ways water is taken in and re-introduced, depending on location, and of the various states water has in the water cycle.

ELL/Special Needs: Model directions. Pair the student with someone who can help him or her. Have students act out or draw their story instead of writing it.

Extensions: Group students (3-5 per group) to create a skit, story book, or poster describing a member’s journey. See attached sheet for further extensions.

Curriculum Connections: Language Arts (writing), Creative Arts (visual, drama)

Resources:

- This lesson has been adapted from “The Incredible Journey” activity in Project WET International - Teaching Guide and Activities Manual .
- This lesson contains information found at <http://www.ugs.state.ut.us/online/PI-39/pi39pg03.htm>.

## Station 1 - CLOUD

You fall as rain onto the Wasatch Range. Go to MOUNTAIN.

You fall as snow onto the Wasatch Range. Go to MOUNTAIN.

You fall as rain into Millcreek stream. Go to STREAM.

You fall as rain into the Great Salt Lake. Go to LAKE.

You fall as snow into the Great Salt Lake. Go to LAKE.

You fall as rain onto your school's playground. Go to STREAM.

## Station 2- MOUNTAIN

You evaporate into the Salt Lake Valley air. Go to CLOUD.

You soak into the valley's ground and get absorbed by a Cottonwood's roots. Go to PLANT.

You seep into Salt Lake Valley's ground and become part of the ground water. Go to GROUND WATER.

You roll down the Wasatch Fault and drop into a stream. Go to STREAM.

You get frozen in ice and stay where you are. Stay on MOUNTAIN.

### Station 3- Great Salt Lake

You are one of countless water molecules in the lake and you stay there.  
Stay in LAKE.

You are one of countless water molecules in the lake and you stay there.  
Stay in LAKE.

You evaporate into the air. Go to CLOUD.

You evaporate into the air. Go to CLOUD.

Some marsh grass at the Great Salt Lake absorbs you, releases you through its blades, and transpires you into the air. Go to CLOUD.

Go to plant but do not roll the dice. Then go directly to CLOUD.

### Station 4- STREAM

You evaporate into the air. Go to CLOUD.

You evaporate into the air. Go to CLOUD.

A cougar comes to Millcreek stream and drinks you. Go to ANIMAL.

You continue rolling downhill and eventually enter the Great Salt Lake. Go to LAKE.

You seep into Salt Lake Valley's ground and become part of the ground water. Go to GROUND WATER.

You seep into Salt Lake Valley's ground and become part of the ground water. Go to GROUND WATER.

#### Station 5- GROUND WATER

You become part of an underground stream that flows into the Great Salt Lake. Go to LAKE.

You become part of an underground stream that flows into the Great Salt Lake. Go to LAKE.

You become part of an underground stream that flows into a spring in Millcreek Canyon, where you become part of a stream. Go to STREAM.

You become part of an underground stream that flows into a spring in Little Cottonwood Canyon, where you become part of a stream. Go to STREAM.

A cottonwood tree takes you in through its roots. Go to PLANT.

You are pumped out of the ground from a well to irrigate a farm in Farmington, Utah. Go to PLANT.

Station 6- COUGAR (Animal)

After using you to process food, the cougar urinates and you end up on the ground. Go to MOUNTAIN.

After using you to process food, the cougar urinates and you end up on the ground. Go to MOUNTAIN.

You are exhaled from the cougar's lungs into the air as vapor. Go to CLOUD.

The cougar uses you for rinsing the bad taste of horse out of his mouth. Go to STREAM.

You evaporate from the cougar's tongue. Go to CLOUD.

You are stored in the cougar's fat. Roll again!

## Station 7- Plant

A pickle weed plant at the Great Salt Lake transpires you into the air. Go to CLOUD.

Some marsh grass at the Great Salt Lake transpires you into the air. Go to CLOUD.

A cottonwood tree transpires you into the air. Go to CLOUD.

A pine tree uses you to grow. Stay at PLANT.

A plant stores you in its edible fruit. The fruit gets eaten by a horse, which in turn gets eaten by a cougar! Go to COUGAR.

Roll Again!

Roll Again!

### The Incredible Journey

Take a journey through the water cycle in the Great Salt Lake Water Basin as a water drop! How will you get to different places? What will happen to you along the way? Use this worksheet to keep track of your adventure!

Station	What Happened?	Where are you going?
Example: Cloud	I fell as rain onto the Wasatch Range.	Mountain
1.		
2		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

10.		
-----	--	--

Fred Marcin  
Bruce Jessop  
Fall, 2004

## **Honey, I Shrunk the Great Salt Lake!**

### **Abstract:**

This lesson on the water cycle physically involves students in simulating molecular movements in each of water's physical states. It introduces students to the scientific process by having them conduct a simple experiment that demonstrates how the sun is the source of energy that causes evaporation. It engages students in a discussion on the Great Salt Lake's shifting shoreline. Parts of this lesson have been adapted from the lesson "Molecules in Motion" taken from Project Wet Activity Guide.

**Grade:** 4<sup>th</sup>

### **Science Benchmark:**

Matter on Earth cycles from one form to another. The cycling of matter on Earth requires energy. The cycling of water is an example of this process. The sun is the source of energy for the water cycle. Water changes state as it cycles between the atmosphere, land, and bodies of water on Earth.

### **Primary Core Objective:**

**Standard I:** Students will understand that water changes state as it moves through the water cycle.

**Objective 1:** Describe the relationship between heat energy, evaporation and condensation of water on Earth

**Objective 2:** Describe the processes of evaporation, condensation, and precipitation as they relate to the water cycle.

### **Intended Learning Outcomes:**

Students will:

- Observe a simple object and report their observations about it.
- Pose questions about objects, events, and processes.
- Record data accurately when given the appropriate form and format (e.g., table, graph, and chart).
- Make simple predictions and inferences based upon observations.
- Use instruments to measure using appropriate units.
- Use observations to construct a reasonable explanation.
- Explain science concepts and principles using their own words and explanations.
- Use scientific language appropriate to grade level in oral and written communication.
- Know science information specified for their grade level.

**Time:** 120 minutes (2 class periods)

**Student Prior Knowledge:**

Previous to this lesson, students should be given an introduction to the water cycle, and should be familiar with the terms solid, liquid, and gas as it relates to water.

**Vocabulary:**

*Water cycle* – the series of conditions through which water naturally passes from water vapor in the atmosphere through precipitation upon land or water surfaces and finally back into the atmosphere as a result of evaporation and transpiration.

*Evaporation* – the movement of water from a liquid state to vapor.

*Condensation* – the movement of water from vapor to liquid

*Precipitation* – water that falls to the earth

*Experiment* – a procedure or operation carried out under controlled conditions in order to discover something or to test a hypothesis.

*Hypothesis* – something not proved but assumed to be true for purposes of argument or further study or investigation.

*Conclusion* – a final result or summing up.

**Background Information:**

The Great Salt Lake is a terminal lake because it has no surface outlet (rivers flowing from it). Water is lost from the lake mostly through evaporation. Evaporation rates are highest during the hot summer months and lowest during the winter. An average of about 2.9 million acre feet of water evaporates from the lake annually. When inflow equals evaporation, the level of the lake remains constant. If inflow is greater or less than evaporation, the level of the lake will rise or fall, respectively. Because of the recent drought, the inflow has been less than evaporation. (This information retrieved from <http://www.ugs.state.ut.us/online/PI-39/pi39pg03.htm> on 11/16/04.)

**Materials:** 2 flashlights (one covered with a red transparency and one with blue), Jars or clear plastic cups (2 for each group), measuring cup, index cards, experiment activity sheet (attached)

**Anticipatory Set:** (30 minutes)

1. Show students old and new aerial photos of the Great Salt Lake (see resources). Ask, “What has changed? Why is the Great Salt Lake shrinking?” Discuss the history of the lake. Ask, “What happens to a puddle of water after you finish playing in it? Can you jump into that same puddle tomorrow? Next week? Where does the water go?”
2. Write *condensation*, *evaporation*, and *precipitation* on the board or overhead. Discuss the definitions for each of these terms (or have a student look them up in the dictionary as you talk. Ask, “What happens to water when it gets really cold? What makes the water change from solid to liquid and from liquid to gas?” This movement of water as it changes between these three states is called the *Water Cycle*.
3. Discuss how water molecules stick together and move very slowly in cold temperatures, but when heat from the sun is directed on them, they move faster and faster until they eventually separate and shoot up into the air because they need room to move. They become less dense.

4. Tell the class they are going to become water molecules. They will begin as water in its solid form, ice. As ice, students stand in place and move very little.
5. Inform students that the flashlight with the red filter will represent heat energy from the sun, and the blue flashlight will represent the loss of heat.
6. Beam the flashlight on a few students. They should begin to move slowly in place, gently bumping into each other. Tell students they are now liquid. As liquid, students should stay close together.
7. Add more heat; the liquid turns into a gas. Students step away from each other and roam randomly around the room.
8. Shine the blue flashlight on the students. The students slow down, forming droplets of water and moving closer together. Continue shining the blue light until they become ice.
9. Have students draw a picture to show how water moves in each of its three states and collect.

### **Procedure :**

Tell students that they are going to conduct an experiment to find out what makes water disappear. Ask, "What is an experiment?" In the discussion they should be told, "You experiment when you perform a test to support or disprove a hypothesis."

Explain that good scientists follow a specific process when they experiment. Use an example to model the scientific process on the board or overhead projector. (The scientist comes up with a question, forms a hypothesis, tests, observes and records the results, and forms a conclusion.) Discuss and explain each step as you write it down.

Separate students into small groups (3-4). Tell students that they will create an experiment, using the scientific process, to find out what makes water disappear. Show them the materials they are going to use. On a sheet of paper, have each student write the steps in the scientific process (question, hypothesis, experiment, results, and conclusion) as they create their experiment. Guide them through the following experiment (or let them figure out their own way):

### **Experiment**

1. Measure – Use the measuring cup to pour the same amount of water in each jar. With a fine marker, draw a line on each jar at the water level.
2. Place one jar in a sunny area, and the other in a dark area.
3. Label one jar *Sunny* and the other *Dark*. On your paper make a chart to record the measurements for each day (model this for them).
4. Observe – Establish a time to check the jars every other day (at the same time) for 1 week, measuring the water level in each jar and recording it on the chart.
5. After a week, revisit the hypothesis and create conclusions based on your observations.

### **Assessment:**

Students will turn in their experiment papers that include the question, hypothesis, experiment steps, results, and conclusion. They should infer that evaporation takes place as the liquid water becomes water vapor from the sun's warmth. They infer this because water can't just "disappear" but has to follow the next step in the water cycle. See rubric.

**Closure:** Discuss with students how the Great Salt Lake is shrinking because it is evaporating faster than water comes into it. It doesn't get as much water as it used to because of the drought and because people are using more of the water before it can make it to the lake. Talk about how the process of the sun's energy causing evaporation is important. Have them name some places on the earth where evaporation takes place. Ask them to identify situations in which evaporation causes problems (swimming pools and fountains lose water, water holes in deserts dry up) and situations where evaporation is helpful (drying cement, clothes hanging on the line, making raisins). Have they noticed that evaporation occurs more frequently in the summer months when the sun is warmer?

**Adaptations for Diverse Learners:**

- Pair students up with someone who can help them. Let them record their results by drawing pictures instead of measuring. Model each step and/or perform the experiment as a class.
- Instead of measuring water in jars, have students pour water on a tray and trace around the outer edge of the puddle every hour with chalk.

**Extensions:** Have students create their own experiments with water, or repeat the experiment by placing the jars in different places. "How were the results similar or different?"

**Resources:**

- Satellite photos and maps of GSL can be found at <http://ut.water.usgs.gov/greatsaltlake/> and <http://www.geocities.com/SouthBeach/Shores/9144/Maps/maps.html>.
- Utah Geological Site <http://www.ugs.state.ut.us/online/PI-39/pi39pg03.htm>)
- *Project WET Curriculum and Activity Guide*, 2004, Watercourse and Council for Environmental Education, ISBN 1-888631-15-5.

Name \_\_\_\_\_

### Experiment!

Question: *What do you want to find out?*

Hypothesis: *What do you think will happen and why?*

Experiment: *Describe how you will perform your experiment and draw a picture of it.*

Observe and Record Your Results: *Write it out, draw pictures, or make a chart.*

Conclusion: *Revisit your hypothesis. Did the experiment prove it or disprove it and why? What did you learn?*

Name \_\_\_\_\_

## Experiment Scoring Rubric

Clear and specific question and hypothesis.	4	3	2	1
Clear description of experiment procedures.	4	3	2	1
Correct use of scientific process.	4	3	2	1
Clear display of results in chart and on graph.	4	3	2	1
Conclusion shows understanding that evaporation takes place as a result of the sun's warmth.	4	3	2	1

4- Excellent (strong, praiseworthy, expressive, valuable)

3- Good (appropriate, sound, credible, interesting)

2- Fair (adequate, sufficient, generally satisfactory)

1- Poor (inadequate, insufficient, not satisfactory)

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_