INCREDIBLE JOURNEY

project WET
WATER EDUCATION TODAY

In this simulation, students model the water cycle by taking on the role of water droplets and moving through different water locations based on the roll of dice. As they track their journey, students explore how water changes form and moves through Earth's systems. By the end of the activity, students develop a deeper understanding of the dynamic nature of the water cycle and how its different states are reflected throughout each stage.

Grade levels: All ages! (K - MS)

Total time: 2 hours

Topics: The water cycle

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At a glance:

Incredible Journey - approx. 2 hours

- **Materials**:
  - Large bowl (clear or white is best)
  - Small bowl or cup that fits in large bowl with clearance on top (clear or white is best)
  - Water
  - Food coloring (optional)
  - Nine different marking pens, beads, stickers or stamps
  - Sturdy string or chenille twists (if using beads)
  - Gift boxes, cardboard, or file folders
- **How many copy pages:**
  - Water Cycle Table (option: one per student)
  - Water Journey Map (one per student)
  - Background Reading (option: one per student)
- **Grouping:** Whole class and Individual
- **Mess factor:** have a broom nearby if you choose to use small objects!

The Incredible Journey

Grade Level
Lower Elementary, Upper Elementary, Middle School

Subject Areas
Earth Science

Duration
Preparation time
30-50 min.

Activity time
Warm Up: 20 min.
Part 1: 45 min.
Part 2: 45 min. or homework
Part 3: 25 min.

Setting
A large room or playing field

Water Literacy Principles
Water connects all Earth systems.

Ocean Literacy Principles
1. The Earth has one big ocean with many features. (a,c,e,f,g)
3. The ocean is a major influence on weather and climate. (b)
6. The ocean and humans are inextricably interconnected.

Climate Literacy Principles
1. The Sun is the primary source of energy for Earth's climate system. (a)
2. Climate is regulated by complex interactions among components of the Earth system. (a,b)

Vocabulary
condensation, evaporation, electromagnetic energy, precipitation, melt, freeze, water cycle, molecule, heat energy, solid, liquid, gas, perspiration, gravity, dew, respiration, digestion, transpiration, sublimation, deposition

GUIDING QUESTIONS

- How does water move through the water cycle?
- Why does water stay longer in some locations compared to others?

Summary

Students simulate the water cycle by becoming water drops and moving through water locations based on the roll of special dice.

Objectives

Students will:

- ✓ **describe the movement of water within the water cycle.**
- ✓ **identify the states of water as it moves through the water cycle.**
- ✓ **understand indigenous perspectives of water based on how water moves through the water cycle.**

MATERIALS

Warm Up (K-2, 3-5, MS)

- Large bowl (clear or white is best)
- Small bowl or cup that fits in large bowl with clearance on top (clear or white is best)
- Water
- Food coloring (optional)
- Nine location signs

Part 1 (K-2, 3-5, MS)

- Nine different marking pens, beads, stickers or stamps
- Sturdy string or chenille twists (if using beads)

- Copies of ***Copy Page—My Incredible Journey*** if using pens, stickers or stamps
- Nine boxes, about 4-6 inches (10-15 cm) on a side (such as a gift box).
  Option: use file folders and ***Resource Page—Cube Template***
- Labels with location printed according to the ***Water Cycle Table***

Part 2 (3-5, MS)

- Copies of ***Copy Page—Water Cycle Table*** (optional)
- Copies of ***Copy Page—Water Journey Map***
- Copies of ***Copy Page—Background Reading***

STANDARDS

Science	**Science and Engineering Practices**	Developing & Using Models
	Core Ideas	Earth Systems Earth Materials & Systems
	Crosscutting Concepts	Systems & System Models Energy & Matter
Core Disciplines	**English and Language Arts**	Reading: Science & Technical Writing
Native Knowledge 360	**NMAI Essential Understandings about American Indians**	2. Time, Continuity, & Change

Background information about the subject of this activity is found at the end of the activity on the ***Copy Page—Background Reading***.

Instructions for assembling the cubes

Use gift boxes, or file folders and the ***Resource Page—Cube Template***, to make cubes for the dice. Gift boxes used for coffee mugs are a good size. There will be one cube per station (i.e., location) of the water cycle. Label the sides of the cubes as indicated in ***Copy Page—The Water Cycle Table***. These labels represent the pathways that water can follow. Explanations for the labels are provided. You can have students make drawings for the dice or print illustrations/photos on label paper and cut them out. Project WET also sells downloads for labels through its store.

Another option is to make a spinner for each station using sturdy cardboard, following the locations in ***Copy Page—The Water Cycle Table*** for each station.

Setting Up the Activity

Place the water location signs around the playing area so that students can easily see them—tape signs to chairs, cones, or use menu card

holders to have them stand up. Locations can be names for lakes, rivers, glaciers, and oceans near you as long as students understand that water moves around the world and does not stay local.

Place a container of beads of a single color, a stamp, a roll of stickers or pens at each station (for example, pink equals glaciers, brown equals soil, etc.). Put the corresponding die that says “STAY" at each station.

*Option: Students can help set up the stations after the **Warm Up** to help with labor.*

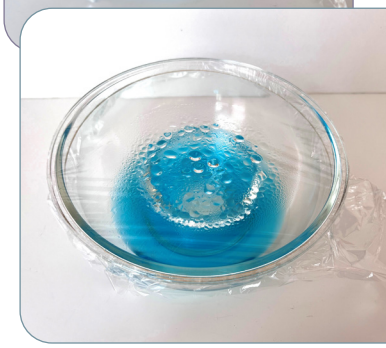
PROCEDURE

Warm Up (K-2, 3-5, MS)

- Create a simple model of the water cycle by placing a dry small bowl or cup in a larger bowl of water. The small bowl represents land and the water represents ocean or lakes in the area.
  - The water should not come up over the top of the small bowl and the small bowl should rest on the bottom of the large bowl without floating.
  - Cover the bowl with plastic wrap and place a rubber band around it. Make sure the plastic wrap does not touch the small bowl.
  - Add ice on top of the plastic wrap. This represents the cooler atmosphere. (Keep an eye on the melting ice so it does not spill.)
  - Watch as water evaporates, condenses on the plastic as “clouds”, then rains down into the cup representing land. This may take a while so play the game in ***Part 1*** then return to the model afterward.

  (*Tip: Using warm water will speed up the process. This can also be set up the day before or early morning and referred to throughout the lesson.*)

Set up



After 1 hour

- Where is water located on Earth? Discuss all nine locations that are part of the journey (ocean, lake, river, glacier, clouds, groundwater, animals, plants, soil).

- Review how water moves from state to state (ice-solid, water-liquid, vapor-gas).
  - Are students familiar with the terms: condensation, evaporation, precipitation, melt, freeze, flow, perspiration, respiration, transpiration, sublimation, percolation? Review and define terms as age appropriate. (3-5, MS)

Part 1 (K-2, 3-5, MS)

1 Students will transform into water molecules (water drops will be easier to understand for younger students) moving through the water cycle.

2 Give each student a chenille twist/craft pipe cleaner and a single bead. For younger students the beads can be attached ahead of time to the end. Older students can attach it themselves. If recording on paper, hand out ***Copy Page—My Incredible Journey***.

a. The starting bead/stamp/sticker can be yellow or solar to represent the sun’s energy driving the water cycle. It can also be one from one of the stations.

3. Students should start at the station that represents the water location on their chenille twist or paper, or they can spread out to different stations to start if using the sun as the starting symbol.

4. In this activity, a roll of a cube determines where water will go. Students line up behind the cube at their station. Students take a bead or marker upon arriving to the front of the station, roll the cube and go to the location indicated by the label facing up. If they roll "stay," they move to the back of the line

5. When students arrive at the next station, they get in line. When they reach the front of the line, they roll the cube and move to the next station (or proceed to the back of the line if they roll stay).

6. Students should keep track of their movements by taking one bead from the station and placing it on their chenille twist (or marking their paper). Students should take one bead for each roll, including "stays."

7. Before beginning, explain some important rules:

    a. One roll per turn.
    b. Mark your journey by taking a bead or marking your paper each roll.
    c. If there is a line, go to the back of the line and wait for your next roll. This is especially important if "STAY" is rolled and there is a line at the station.
    d. The game will begin and end when the teacher indicates.

8. Begin the game!

9. Stop the game after several minutes, depending on the size of the group. Students should have rolled at least 15 times each.

10. K-2 students can turn their journeys into bracelets.

Tips and Tricks

- **Younger students may get frustrated when "stuck" in one location. Allow them to move after five rolls to another location on the die.**
    - **To increase the pace of the game, use more boxes at each station, especially at the clouds and ocean stations.**
- **If making bracelets, be sure to use something sturdy that ties well and will not fall apart (such as chenille twists).**
- **Use wooden beads or dyed pasta as "green" alternatives to plastic beads.**

Part 2 (3-5, MS)

1 Ask students to form a circle and hold up their journeys so all can see. Did anyone have the same journey? What do they notice about all the students' journeys?

2 Several students should share their journeys starting with their first station and using the proper terms you reviewed in the ***Warm Up*** to explain water's movement from one location to another. Discuss the form in which water moves from one location to another (solid, liquid, or gas).

a. Native Americans believe that water is alive with a spirit. How does this activity enforce that belief?

3 Could students get to every location from each station? Why or why not? Have students examine the dice and discuss why these dice are "rigged" (i.e., water can only go to certain places and has a higher chance of going to some locations more than others). ***The Water Cycle Table*** provides an explanation of water movements from each station.

a. You may want to pass out copies of ***The Water Cycle Table*** for students to review. They may need them for writing their water stories during Step 7.

4 Give each student a ***Copy Page—Water Journey Map***. Students will record their journey by drawing arrows from one station to the next. Anytime they stayed at a station they should mark this with a symbol of their choosing, such as a star or a circle. Students should also write the terms for each movement on their map. Anytime water moved from one location to another as water vapor students should record this on their map.

5 Students should add up the number of times they were in each location. Which locations were they in the most?

b. Express the number of times in each location as a ratio of the total number of movements (e.g. ocean as 5/10 means a student was in the Ocean 5 times out of the 10 different beads or stamps on their journey.

c. Record the length of time in each location (*i.e.*, did they stay for one roll or 5 rolls of the dice?). How does this compare with the residence times located in the ***Copy Page—Background Reading***.

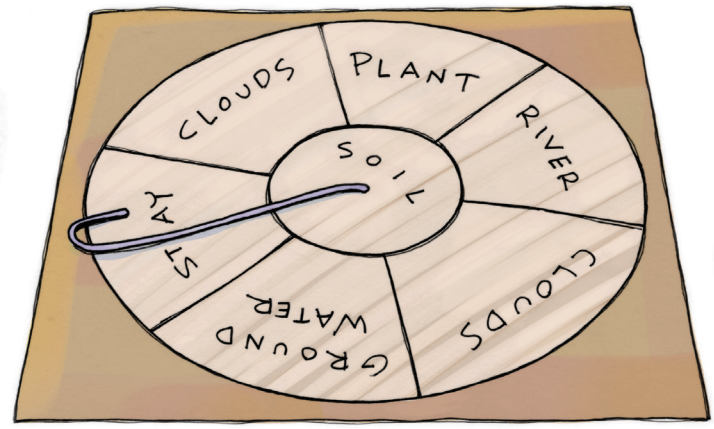
6 Discuss and compare the movement of water during different seasons and at different locations around the globe. How could you adapt the game (e.g., change the faces of the cubes, add alternative stations) to represent these different conditions or locations?

Did You Know?

People use water from many locations: groundwater, rainwater (clouds), lakes, rivers, plants, animals, and even ocean water (through desalinization).

Try This!

- **A spinner may be made for each station instead of using dice.**
  - **Use cardstock paper to create spinners.**
  - **Follow instructions on *The Water Cycle Table* for spinner sections.**
  - **Use an unfolded paper clip as a spinner.**



7 Refer back to the water cycle model in the ***Warm Up***. Identify the geosphere (small bowl) hydrosphere (water), and atmosphere (water vapor and condensation on plastic). Where would the biosphere be? (In the water and on land.) How does this model represent the water cycle? What is the model missing?

8 As an assignment, students can use their bracelets and travel records to write stories about the locations water has been. Students should read the ***Copy Pages—Background Reading*** for context about resident time and indigenous perspectives on water. They should incorporate these into their stories and include a description of what conditions were necessary for water to move to each location and the state water was in as it moved. Reflect on the Native perspective of water as alive.

Part 3 (MS)

1 Discuss the conditions that cause water to move. Water movement depends on energy from the Sun, electromagnetic energy, and gravity. Sometimes water will not go anywhere (this is the resident time).

2 How does the water cycle clean water from pollution? Students can include this in their stories.

a. During the ***Warm Up***, incorporate pollution in the form of food coloring and/or dirt or coffee in the bowl of water. Watch how evaporation removes pollutants on the plastic wrap and in the smaller bowl collecting precipitated water.

3 Provide students with a location (e.g., parking lot, stream, glacier, or one from the human body) and have them identify ways water can move to and from that site along with the states of the water.

REFLECTIONS

- Where is water located on Earth? (K-2, 3-5, MS)
- What are the terms for movement of water to various locations? List by location. (3-5, MS)
- Where does water stay the longest? Where does it stay the shortest amount of time? (3-5, MS)

- How do Native perspectives of water differ from Western perspectives? (3-5, MS)
- What forces drive the movement of water? When does water transfer from location to location as a gas (water vapor)? (MS)
- How does the water cycle clean pollution from water? (3-5, MS)
- Are there opportunities for older students to teach "The Incredible Journey" to younger students? (3-5, MS)

DIGITAL RESOURCES

The Water Project: Create a Mini Water Cycle—see instructions on a version of the ***Warm Up***.

DiscoverWater.org: The Water Cycle and the Blue Traveler—for virtual versions of this activity

USGS: Water Cycle Diagram—USGS's official water cycle diagram.

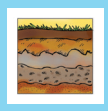
CHARTING THE COURSE

Water on Earth	Water & Life	Physical & Chemical
• Blue Planet • Great Water Journeys • Snow and Tell	• Thirsty Plants • Drop in the Bucket	• Molecules in Motion • H_2Olympics

Localize It!

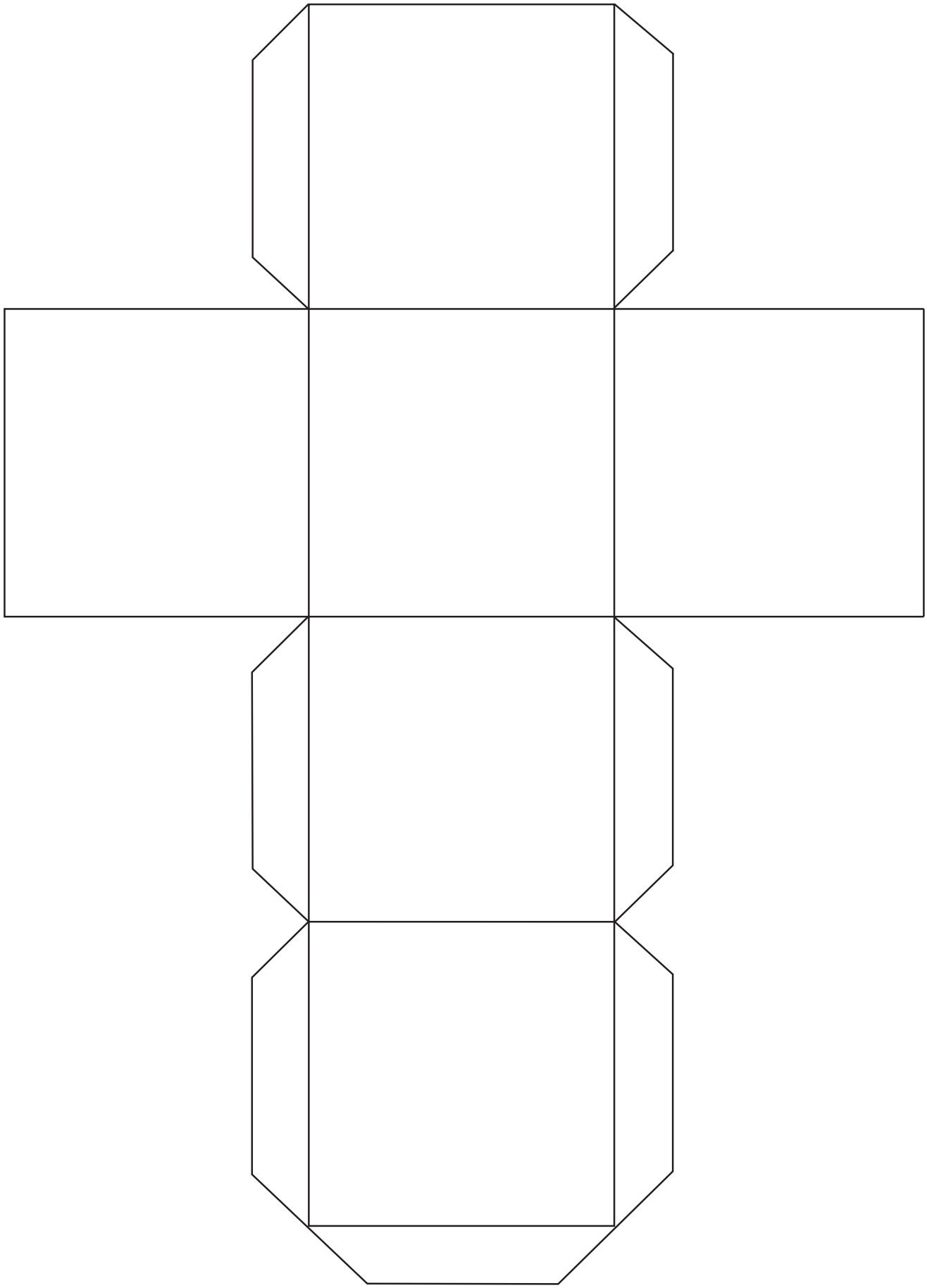
- **Create a photo or video documentary of the local watershed that represents each aspect of the water cycle to print in the local or school newspaper or to post online to a blog or video site.**
- **Station locations can be names for lakes, rivers, glaciers, and oceans near you, as long as students understand that water moves around the world and does not stay in one place.**
- **Explore your local urban water cycle. Water moves differently in an urban system with the help of water treatment and wastewater treatment plants, as well as stormwater drains and ditches.**
  - **What do the urban water cycle and natural water cycle have in common? (purifying water, changing states, flowing into other places)**
  - **Do some communities have better services for removing stormwater or purifying water? Explore these environmental justice issues with your students.**

Copy Page –The Water Cycle Table (page 1 of 2)

SOIL 	**one side plant**	Water is absorbed by plant roots.
	one side river	The soil is saturated, so water runs off into a river.
	one side groundwater	Water is pulled by gravity; it filters into the soil.
	two sides clouds	Water evaporates and goes to the clouds.
	one side stay	Water remains on the surface (perhaps in a puddle or adhering to a soil particle).
PLANT 	**four sides clouds**	Water leaves the plant through the process of transpiration.
	one side stay	Water is used by the plant and stays in the cells.
	one side animal	An animal ate a plant and absorbed the water.
RIVER 	**one side lake**	Water flows into a lake.
	one side groundwater	Water is pulled by gravity; it filters into the soil.
	one side ocean	Water flows into the ocean.
	one side animal	An animal drinks water.
	one side clouds	Water evaporates and goes to the clouds.
	one side stay	Water remains in the current of the river.
CLOUDS 	**one side soil**	Water condenses and falls on soil.
	one side glacier	Water condenses and falls as snow onto a glacier.
	one side lake	Water condenses and falls into a lake.
	two sides ocean	Water condenses and falls into the ocean.
	one side stay	Water remains as a water droplet clinging to a dust particle.

OCEAN 	**two sides clouds**	Water evaporates and goes to the clouds.
	four sides stay	Water remains in the ocean.
LAKE 	**one side groundwater**	Water is pulled by gravity; it filters into the soil.
	one side animal	An animal drinks water.
	one side river	Water flows into a river.
	one side clouds	Water evaporates and goes to the clouds.
	two sides stay	Water remains within the lake or estuary.
ANIMAL 	**two sides soil**	Water is excreted through feces and urine.
	three sides clouds	Water is respired or evaporated from the body.
	one side stay	Water is incorporated into the body.
GROUNDWATER 	**one side river**	Water filters into a river.
	two sides lake	Water filters into a lake.
	three sides stay	Water stays underground.
GLACIER 	**one side groundwater**	Ice melts and water filters into the ground.
	one side clouds	Ice evaporates and water goes to the clouds (sublimation).
	one side river	Ice melts and water flows into a river.
	three sides stay	Ice stays frozen in the glacier.

Resource Page–Cube Template



NAME:

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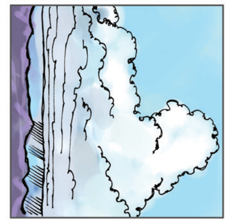
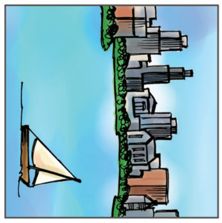
Copy Page – Water Journey Map

Clouds

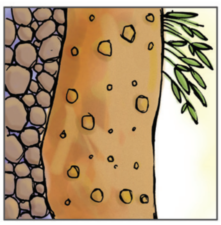


Lake



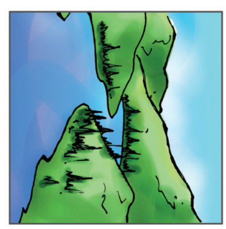
Animal

Groundwater



Soil

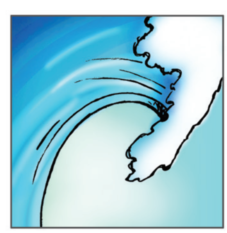
River



Glacier

Plant

Ocean



Water is always moving through the **water cycle** and the **heat energy** from the sun affects how fast **water molecules** move. When water gets hotter, it can change from a **solid** to a **liquid** to a **gas**. Each time it changes, it usually moves to a different place. For example, glaciers **melt** and become pools, which then flow into streams. Some of the water in the streams evaporates into the air.

Animals (including humans) are part of the water cycle as they take in water and then remove it.

Gravity also plays a role in moving the water on Earth's surface. The most obvious way we see water moving is when it's in its liquid form. We see it flowing in streams and rivers, and crashing in ocean waves. Water can also move underground, slowly seeping through soil and rocks. We can't see it, but water moves the most dramatically when it's a gas. It **evaporates** and becomes a gas in the **atmosphere**. In fact, water vapor is always around us. It comes back down to Earth as rain or other forms of **precipitation** when it cools down and **condenses**. The amount of water vapor in the air changes depending on the temperature, climate, and ecosystem. Water droplets in clouds form around tiny dust particles. Eventually, the droplets become too heavy and fall to the ground because of gravity.

Living things also help move water. Humans and animals carry water inside their bodies from one place to another. Some of it gets used up, while some of it gets removed from our bodies through **digestion** as waste, during **respiration** (when we breathe), or **perspiration** (when we sweat). Plants are the biggest movers of water. Their roots absorb water and it travels up to the leaves. When the water reaches the leaves, it evaporates into the air. This is called **transpiration**. Water molecules can stay in different places for different amounts of time. For example, water in plants and animals stays for about a week, while water in rivers stays for about two weeks. Water in lakes stays for 10 years, and water in oceans can stay for thousands of years. The ocean holds the majority of the water on Earth, and most of the evaporation happens there. Sometimes, water can go directly from a solid to a gas without becoming a liquid first. This is called **sublimation**. The opposite of sublimation is **deposition**, when water vapor changes directly into ice—such as snowflakes and frost.

Average Resident Time for a Water Molecule	
Plants & Animals	1 week
Clouds	10 days
Rivers	2 weeks
Soil	2 weeks-1 year
Lakes	10 years
Oceans	4,000 years
Groundwater	2 weeks -10,000 years
Glaciers	1,000 -10,000 years

Water is purified during the water cycle. For example, when it moves through soil, it can pick up contaminants, but when it evaporates, it becomes pure again.

The water cycle connects all living and non-living things on Earth—soil, plants, rocks, animals, and air, to name a few.

Copy Page – Background Reading (page 2 of 2)

Indigenous perspectives

Many indigenous cultures believe water is alive. Native cultures all over the world have stories of how the Earth began that include water.

Water is necessary for survival, and knowing how to find and collect it is an important skill passed down through generations. This continues through stories and information passed down through generations.

Indigenous people and their ancestors have understood that water exists in many locations. After experiencing the movement of water through the Incredible Journey, do you think water is alive?

A Native American man with a sacred drum, honoring water.

Career Connections

BOTANIST • CLIMATOLOGIST • ECOLOGIST • GEOLOGIST • GLACIOLOGIST
HYDROLOGIST • METEOROLOGIST • OCEANOGRAPHER • SOIL SCIENTIST

ABOUT PROJECT WET

Our Mission

We empower educators to engage youth to understand water and solve local and global challenges.

The cornerstone of Project WET is its methodology of teaching about water resources through hands-on, investigative, easy-to-use activities. Lessons are inquiry-based, age-appropriate, and designed to teach place-based STEM education through the lens of water. Our lessons are not only academically rigorous, but they are also fun for educators and youth!

Terms of Use:

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YOU MAY ALSO BE INTERESTED IN...

- **Blue Planet - free activity download**
  - Students learn about gathering data to determine what percentage of Earth's surface is covered

- **Discoverwater.org**
  - A free, interactive website designed for use by children ages 7-12.

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Have questions?

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