



# Earth's Four 'Spheres'

Water Science: Hydrosphere

This activity satisfies one of the required JNMN lessons needed to complete the Junior Water Science Master Badge.

Appropriate Ages 8-12

Expected Time: 55 min

## BEFORE YOU TEACH

### Learning Objectives:

Students will be able to define earth's four 'spheres' and how they interact as a system to support life and modify earth's features.

### NE Science Standards:

Grades 3-6

SC.3.7

SC.4.6.3.B

SC.5.13.4.A.

SC.5.13.4.C.

SC.6.13.5.A

### Did You Know...

3/4 of the world's water is undrinkable

The Earth's hydrosphere is estimated to be around 4 billion years old

The Earth's hydrosphere contains around 366.3 sextillion gallons of water, that's 21 zeros!

The Earth's hydrosphere makes up 0.023% of the Earth's total mass.

### BACKGROUND KNOWLEDGE

The Hydrosphere is associated with water in the liquid state, which covers about 70% of the Earth's surface. Most liquid water is found in the oceans. Our Hydrosphere gives Earth a distinct appearance as a blue marble and separates us from other planets in the solar system. Only a small portion of the Earth's water is freshwater, found in rivers, lakes, and groundwater. Water in a gas state (water vapor) is probably best considered as a feature of the Atmosphere.

Source: [myasadata.gov](http://myasadata.gov)

### Materials And Prep:

"Earth's Four Spheres" worksheet  
Earth spheres photoset

### Engage: 10 min

Explain to students that everything in Earth's system can be placed into one of four major subsystems: land, water, living things, or air. These four subsystems are called "spheres." They are the Geosphere (land), Hydrosphere (water), Biosphere (living things), and Atmosphere (air). Give each student an "Earth's Four Spheres" worksheet. Instruct them to fill out the chart by listing examples of what exists in each 'sphere'. For example, students might write 'lakes and rivers' in the hydrosphere box, 'plants and animals' in the biosphere box, 'oxygen' in the atmosphere box, and 'rocks and soil' in the geosphere box. Have them be as specific as possible and think of as many examples as they can.

### Explore: 5 min

After students have several examples listed in their boxes, complete the next activity as one group. From each sphere, have them choose just one example. There should be one example each for the Biosphere, Geosphere, Hydrosphere, and Atmosphere. What four did they choose?

Step 1: Begin with the example for the Geosphere and then draw its interaction with the Hydrosphere. An example might be a canyon with a river running through it.

Step 2: Repeat the drawing of the interaction with the Hydrosphere, but this time with the Atmosphere's chosen example. Perhaps draw clouds that are raining.

Step 3: Again draw the interaction with the Hydrosphere, this time using an example from the biosphere, such as a squirrel drinking from a stream.

Next, break into pairs and students will do the same sequence of drawings, choosing from their own favorite example from each sphere, and drawing that interaction with the Hydrosphere.

### VOCABULARY

**Hydrosphere:** Earth's system that includes all of the water in all of its forms (ice, water, and water vapor)

**Biosphere:** Earth's system that includes all living things and organic material.

**Geosphere:** Earth's system that includes all land matter.

**Atmosphere:** Earth's system that includes all gasses surrounding the planet.





**Explain: 10 min**

Have students share their interactions. Explain why the interactions are important and how they help keep our ecosystems healthy. Ask students to describe what would happen to each "sphere" if it couldn't interact with the hydrosphere. For instance, the biosphere needs the hydrosphere because all living things need water. Every sphere is necessary and connected. Ask students what would happen to habitats and wildlife if there was not a hydrosphere.

**Extend: 15 min**

Go for a walk outside of the school, and make observations of hydrosphere interactions. Each student should create a list of ways they can see the hydrosphere working around them. Examples could be clouds in the sky (atmosphere), plants getting water (biosphere), weathering and erosion (geosphere), etc.

**Evaluate: 15 min**

Once students are back in the classroom, have them write a short story from the perspective of one water drop moving between all of the spheres. It may start as part of a river that erodes a rock, then evaporates into a cloud, before being rained into a pond where a bird is taking a bath. Let students be as creative as they want while telling the story.

## Hands On Extension

**In the Lab:**

Call your local water utility and ask for their usage estimate for total number of gallons used by residents for the month of February and June. Perhaps explain to the person answering the phone that you would like an actual number but if that isn't possible then an estimate will work. Keep in mind there might be a day's turnaround time to get your answer.

Explain that for this activity that it is estimated that each person in the U.S. uses 80-100 gallons of water each day. Ask students to estimate the amount of water (in gallons) needed for every person in their city. Each student comes up with their own estimate, but then the entire group must settle on an estimate. Identifying different variables that impact water usage is a good starting off point.

Students may differ on how to calculate this estimate. Have the class vote to decide what water usage estimate to go with. Using the water utility's information you researched, compare February's usage and find out who has the closest estimate, the group or a specific student. Play this estimation game again using data from the month of June. Finish the lesson by sending students home with the assignment to gather their family's water bill and compare it with today's estimates and numbers. Next time, given the numbers they found for their family's water usage, was 7 gallons per person was a realistic estimate?

\*COMPLETING THIS ACTIVITY WILL COUNT AS YOUR SECOND ACTIVITY REQUIREMENT FOR THE ZOOLOGY MASTER BADGE.

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