How much of the earth is covered by water?

Objective: Students will evaluate the percentage of water coverage on the planet

Age Group: Elementary and Middle

Materials:
- ✓ Spinning globe or inflated globe ball

Curriculum Connection:
8.P.2: Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources
EEn.2.4: Evaluate how humans use water
NC.6.RP.1-4: Understand ratio concepts and use ratio reasoning to solve problems
NC.6.SP.1-3: Develop understanding of statistical variability

What you need to know:

The earth has a lot of water! Approximately 71% of the earth is covered by water in the form of oceans, glaciers, lakes, rivers, and swamps. Most of that water (~97%) is saltwater which cannot be consumed by humans; only 3% of the earth's water is freshwater. However, not all that freshwater is available for us to use: 69% of freshwater is frozen in icebergs or glaciers and 30% is in the ground. That leaves only ~0.3% of the earth's freshwater on the surface in lakes, rivers, streams, swamps, etc. Approximately 22% of the water used for our daily uses, like drinking and cleaning, comes from groundwater, while over 77% of the water we use comes from surface water. Wetlands are very important to this freshwater because they help keep it clean and filtered and store it as groundwater. [Unfortunately, some studies estimate that 71% of the earth's wetlands have been lost since 1900. (Newsweek March 21, 2018)] In this activity, students will be able to evaluate how much of the earth is covered by water, and then discuss the availability of freshwater and what we can do to conserve that resource.

One estimate of global water distribution (% are rounded, so will not equal 100)
(USGS Water Science School https://tinyurl.com/y2874reb)

Water source	Water volume, in cubic miles	Water volume, in cubic kilometers	Percent of freshwater	Percent of total water
Oceans, Seas, & Bays	321,000,000	1,338,000,000	--	96.54
Ice caps, Glaciers, & Permanent Snow	5,773,000	24,064,000	68.7	1.74
Groundwater	5,614,000	23,400,000	--	1.69
Fresh	*2,526,000*	*10,530,000*	*30.1*	*0.76*
Saline	*3,088,000*	*12,870,000*	*--*	*0.93*
Soil Moisture	3,959	16,500	0.05	0.001
Ground Ice & Permafrost	71,970	300,000	0.86	0.022
Lakes	42,320	176,400	--	0.013
Fresh	*21,830*	*91,000*	*0.26*	*0.007*
Saline	*20,490*	*85,400*	*--*	*0.006*
Atmosphere	3,095	12,900	0.04	0.001
Swamp Water	2,752	11,470	0.03	0.0008
Rivers	509	2,120	0.006	0.0002
Biological Water	269	1,120	0.003	0.0001

The activity:

❖ If using a spinning globe, have students spin the globe one at a time, and then place a finger on the globe to stop it with eyes closed; have the student say whether their finger lands on land or water

❖ If using a globe ball, have students toss the ball in a circle; whenever the ball is caught, have the student say whether their right thumb is on land or water

❖ Keep a tally of how many times a student says "water" and how many times a student says "land"

❖ Repeat the tossing or spinning until 40+ data points have been recorded

❖ Add the tallies together, and then calculate the percent cover for both land and water using the formulas below:

times on land + # times on water = total points

$$\frac{\text{\# times on land}}{\text{total points}} \times 100 = \% \text{ land}$$

$$\frac{\text{\# times on water}}{\text{total points}} \times 100 = \% \text{ water}$$

Follow up:

Now we know that the earth's surface is mostly water, but how much of that water is readily available for us to use? And where can we find that useable water?

Saltwater cannot be used for human consumption and a lot of freshwater is frozen in glaciers (69% of the 71%). That leaves less than 0.3% of freshwater available on the surface (0.3% -of the 71%)! There is also freshwater in groundwater (30% of the 71%), but we are not able to access or use all of it.

Do you think water is a resource that should be protected? Is it important to protect the quality of the water, the quantity of water, or both?

Approximately 4% to 6% of the earth's surface is wetlands. How might these wetlands help protect the quality of our water?

Can protecting wetlands help protect water quality? (See other ncwetlands.org pages and downloadable materials for ideas on answering this question.)

How should we protect our available freshwater from being used up? What are some ways you can use less water?

Math discussion:

• Since 71% of the Earth is covered by water, what is your prediction for how many times we would have landed in water (with the spinning globe/tossing ball experiment) if we spun/tossed 100 times? 50? 10?

• Did the number of times we landed on land vs. water match up with your prediction? Why or why not?