

WATER FOR LIFE

FAST FACTS

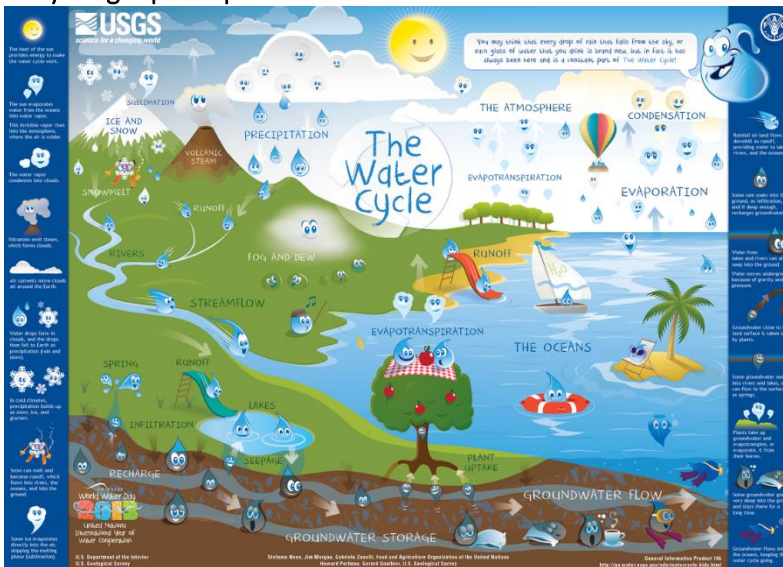
Water Cycle and Groundwater

- A water cycle means that the amount of Earth's water stays the same; it just moves around. This means that the same water we drink, may have been drunk by a dinosaur 70 million years ago.
- The sun is the source of energy for the water cycle.
- The basic steps of the water cycle are:
 - Ocean Storage: most of the Earth's water is in oceans, and too salty for us to drink.
 - Glacier Storage: Most of the fresh water on earth is stuck in glaciers (mostly in Antarctica) far away from where most people live.
 - Aquifer Storage: The next largest amount of Earth's fresh water is groundwater that is stored in rocks called aquifers.
 - Evaporation: the sun heats up the water and turns it into water vapor in the atmosphere. Most of the time we do not notice water vapor.
 - Condensation: when water vapor cools in the atmosphere, it condenses, or turns into a liquid against small dust particles to form clouds. Fog is a low lying cloud.
 - Precipitation: when the clouds get heavy, droplets of water fall to the Earth as rain, snow, sleet, ice, and hail.
 - Runoff: when precipitation hits the Earth, it flows along the surface forming puddles or creeks and rivers.
 - Infiltration: when water hits the Earth, it may sink slowly into the soil, wiggling its way between the soil and rocks. Infiltration takes a long time.
 - Transpiration: Plants take in water through their roots, they give off some water as water vapor back into the air.
- Most of the Earth is covered in "saline," or salty water that people cannot drink without expensive processing.
- The majority of the Earth's fresh water is stored in ice caps and glaciers, far away from where most people live.
- The next most abundant source of fresh water is groundwater, in which people need wells to get the water out.
- The rest of the fresh water is found in lakes, then swamps, and only a tiny little bit of fresh water is found in rivers and streams.
- Groundwater is important is very important for drinking water, for irrigating crops like corn and wheat.
- Like water, pollution can move through the water cycle, too. Acid rain can contaminate lakes and harm plants. Oil can flow across a parking lot and get into a pond and a wetland. Pollution on the earth can even get into the groundwater.
- Conservation means using a resource wisely so that we do not run out. On average, one person uses 100 gallons of water per day. Most of that water is actually used to flush toilets.
- Water treatment plants take water out of the lakes and rivers and clean it before we drink it. Water that is flushed in a toilet either goes to a waste water treatment plant where it is cleaned and put back into the river, or into a septic field in a backyard, where it moves back through soil to become cleaned.
- It is very important to protect groundwater because it is very hard to clean once it has become contaminated.
- We use water for producing electricity from dams, for irrigating crops, feeding livestock, for factories and industries, and for people to use in their homes.
- Much of the water we use goes straight down the toilet and needs to be cleaned.
- Almost every city gets water from rivers and lakes for us to drink and puts used/cleaned water back into

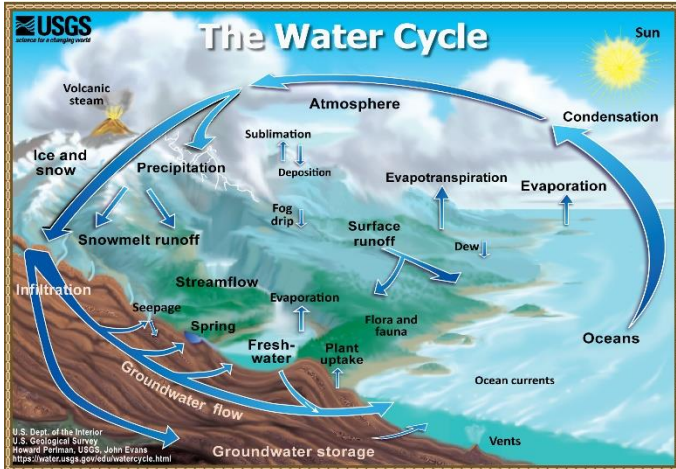
rivers/lakes, too.

- Water pollution can either be “point source,” which is like from a pipe from a factory or spill, or it can be “non-point source” where it is carried along by runoff after a rain or storm. Oil that leaks from a broken pipeline is a point source, but oil that comes from an old car that leaks oil in a rainbow colored puddle is non-point source.
- Rivers lead to the lakes and to oceans. It can take a few weeks to a few months for water to make its way to the oceans.
- In North Carolina, our rivers either go to the Atlantic Ocean or to the Gulf of Mexico eventually.
- North Carolina has rivers that have pollution from sediments from soil erosion, nutrients from animal waste and fertilizer, and chemicals from industry. Most of our rivers are in good shape, but some of the rivers and creeks have pollution problems.
- Too much fertilizer causes algae to bloom, which forms a thick layer of slime, and starts to die off because it blocks the sunlight from the rest of the algae or winter comes and the algae dies. When plants die, then they decompose, which means the bacteria break down the dead plants and use up the oxygen that fish need to breathe. Sometimes we have “fish kills” from this process, which is called eutrophication.
- Wetlands like swamps and marshes have special plants that work like sponges to clean the water from pollution.
- Salt water can flow into fresh water wells from the ocean. This process is called salt water intrusion. If we pump out the fresh water to use it, the salt water flows in from the sea and makes the water too salty for us to drink.
- Hurricanes have a lot of precipitation, which can cause flooding that moves pollution into rivers and the ocean.
- Storm drains in a city or town generally take water (and any pollution) straight into creeks, rivers, and lakes. NEVER dump chemicals or garbage down the storm drains.
- Our waste water treatment plants are designed to clean human waste (feces and urine, toilet paper), but they are not efficient at removing used cooking oil, or chemicals out of our used water.

For younger participants



For 5th Grade and Up



Science Vocabulary

- **Aquifer:** a porous underground layer of rock that can hold large amounts of water
- **Infiltration:** part of water cycle in which water seeps into rocks between particles of soil
- **Wetland:** areas of land that are covered with a shallow layer of water for at least part of the year
- **Well-head protection:** area directly adjacent (next to) a well, keeping it safe
- **Porosity:** measurement of spaces inside a rock or soil (sponge)
- **Permeability:** having connected spaces or pores that allow water to flow through
- **Water table:** is a level of rock or soil beneath the surface at which the soil becomes completely saturated with water
- **Pollution:** can be point source or non-point source contamination of a natural resource
- **Contamination:** the process of adding harming chemicals
- **Zone of saturation:** in an aquifer, the water-filled rock
- **Zone of aeration:** in an aquifer, the air-filled rock
- **Drought:** widespread and long-lasting periods of below average precipitation causing a water shortage

Printable Handouts

1. Go to this website to print one copy of the water cycle per group
<https://water.usgs.gov/edu/graphics/watercycle-usgs-screen.jpg>
2. Print one copy of the water survey for each group <https://www.wpa.gov/sites/production/files/2017-03/documents/ws-kids-test-your-watersense.pdf>
3. Print one copy of the lab per group from NC CAP's Water for Life: How do wells work?
4. Print one copy per family for STEM To-Go: Water for Life.

Kid-Tech Spot: Supplemental interactive websites and games

1. Calculate how much water you use: <https://water.usgs.gov/edu/activity-percapita.html>
2. Water Taste Test: How does your water taste in comparison with other North Carolina locations? With other states? To other places in the world? <https://water.usgs.gov/edu/activity-watertaste.html>
3. Water Science School: https://www.usgs.gov/special-topic/water-science-school/science/water-cycle-schools-and-kids?qt-science_center_objects=0#qt-science_center_objects
4. What is a Superfund? How close are you to a Superfund? <https://www.epa.gov/superfund/search-superfund-sites-where-you-live>

More resources, just in case

1. Resources for Teachers: https://www.usgs.gov/special-topic/water-science-school/science/teachers-resources-water-education?qt-science_center_objects=0#qt-science_center_objects

In the News

1. English/Language Arts Extensions for Middle to High School age participants:
 - a. Gen X and Chemours in NC: <https://www.fayobserver.com/news/20190306/tests-show-high-levels-of-genx-in-chemours-wells>
 - b. Duke Coal Plants and Groundwater Pollution:
 - i. <https://www.scientificamerican.com/article/duke-ordered-to-stop-groundwater-pollution-at-north-carolina-coal-plants/>
 - ii. <https://www.newsobserver.com/latest-news/article222355625.html>
2. Environmental Justice: Did you know that the Environmental Justice Movement began in North Carolina?
<https://www.energy.gov/lm/services/environmental-justice/environmental-justice-history>

On the Road

1. Field Trip Resource: <http://www.carolinafieldtripsmag.com/>
2. Eno River State Park: Collect the waterbugs to calculate how clean the river is.
3. Check with your local waste water facility and drinking water facility. Many will host field trips.

Other lessons and reference materials used to develop this unit

This lesson was adapted from *Project Wet, Every Drop Counts* and the following resources.

<https://www.epa.gov/superfund/search-superfund-sites-where-you-live#map>

<https://water.usgs.gov/edu/activity-watertaste.html>

<https://water.usgs.gov/edu/graphics/watercycle-usgs-screen.jpg>

<https://www.epa.gov/sites/production/files/2017-03/documents/ws-kids-test-your-watersense.pdf>

<https://water.usgs.gov/edu/activity-tf-groundwater.html>

<https://www.epa.gov/sites/production/files/2017-03/documents/ws-kids-test-your-watersense.pdf>

<https://19january2017snapshot.epa.gov/www3/watersense/pubs/indoor.html>

<https://www.epa.gov/sites/production/files/2017-02/documents/ws-ourwater-falw-family-fact-sheet.pdf>

<https://www.usgs.gov/special-topic/water-science-school>

<https://www.dailymail.co.uk/sciencetech/article-3101363/Have-drunk-dinosaur-urine-glass-water-contains-100-Jurassic-pee-claim-scientists.html>

<https://www.fayobserver.com/news/20190306/tests-show-high-levels-of-genx-in-chemours-wells>

<https://www.scientificamerican.com/article/duke-ordered-to-stop-groundwater-pollution-at-north-carolina-coal-plants/>

<https://www.newsobserver.com/latest-news/article222355625.html>