



The Book Planter



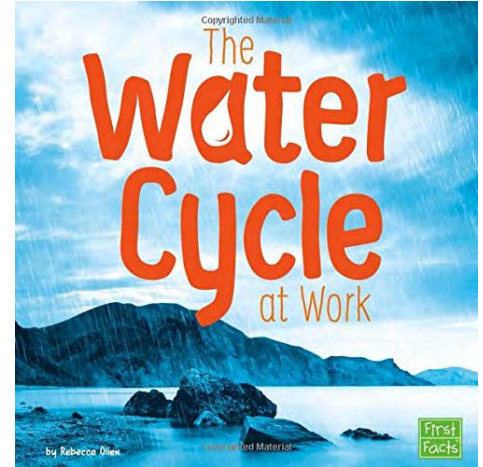
Ag in the Classroom

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April 2020: *The Water Cycle at Work*

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Why is rain important to humans, but especially farmers? Why does it rain? Students will learn the answers to those questions, as well as the meanings of several vocabulary words as they relate to the water cycle: evaporation, precipitation, and condensation to name a few. Each stage of the water cycle is explained in this book, along with helpful illustrations. The book even includes an activity to help students understand the water cycle.



Fun Facts

- North Carolina experienced a record drought in 2007, when all of the state's 100 counties experienced moderate to exceptional drought conditions.¹
- North Carolina has nearly 6,000 regulated public water systems in the state. About three-fourths of the state's population lives in areas served by community water systems. Other people are served by different types of public water systems, such as workplaces, schools, parks or restaurants.²
- Agriculture accounts for approximately 80% of the United States' consumptive water use. Although agriculture counts for a large portion of our water supply, farming could not provide food for the world's large population without the irrigation of crop fields.³
- **Irrigation** (a system or method for watering) has been around for as long as humans have been cultivating plants.³

Vocabulary

Read the book, *The Water Cycle at Work*, and ask students to write their own definitions for the words below. After the reading, call on students to read their definitions for the vocabulary words. Read back through the book for clarification, if needed.

Condense: to change from a gas into a liquid

Cycle: something that happens over and over again

Evaporate: the action of a liquid changing into a gas

Hail: small balls of ice that form in thunderstorm clouds

Humidity: the measure of moisture in the air

Precipitation: water that falls from the sky as rain, sleet, snow, or hail

Replenish: to make full again

Seep: to flow or trickle slowly

Sleet: rain that freezes as it's falling and hits the ground as frozen pellets of ice

Vapor: a substance in gas form

Water in Agriculture³

1. Show your students the *Water in Agriculture* pictures (attached to this activity sheet, and in **Links** section). You can print these or project them on a screen.
2. As you display the pictures, ask students to identify any common features in the pictures.
 - a. Students should recognize water in each picture. They should also recognize that each picture shows a plant or animal that is produced to provide food for humans.
3. Begin a basic conversation with your students about the importance of water. Likely, they already know that we need water in our bodies to live and be healthy. Help them extend their knowledge and begin to understand that without water, farmers could not provide our food.
4. Next, discuss the many ways water is necessary for food processing (cleaning, cooking, and packaging our food after it leaves the farm). Help students also discuss the importance of water in restaurants and keeping us safe from foodborne illnesses.⁴

Changing States³

Vocabulary

Gas: a state of matter where a substance (such as oxygen or hydrogen) is like air and has no fixed shape

Liquid: a state of matter in which a substance exhibits ability to flow freely like water; not a solid or a gas

Solid: a state of matter where a substance has a definite shape and volume; not liquid or gaseous

Water: a transparent, odorless, tasteless liquid; a compound of hydrogen and oxygen, H₂O

Conduct this activity with your students to help them understand that water exists in different forms. Water can exist as a liquid (water), solid (ice), or gas (water vapor) and can change easily from one form to another.

Materials:

- Water
 - Ice
 - Clear bowl
1. Place one cup of water into a clear bowl. Place a piece of masking tape on the outside of the bowl at the top of the water line. Set the bowl on a sunny window sill. Check the bowl every half hour to see what happens. The sun will warm the water and cause the water to evaporate. This means that the water will turn from a liquid into a gas (water vapor). The amount of water in the bowl will decrease when the liquid turns into water vapor. (Remind students that we cannot see water vapor.)
 2. After you place the bowl of water on the window sill, fill a clear glass three-fourths full with ice. Set the glass of ice where most students can watch it. Check the glass every 15 to 20 minutes to see what happens. Explain to your students that ice is the solid state of water. Ice will melt because the classroom is not a cold enough temperature to keep the ice frozen. The melting ice demonstrates the change of a solid to a liquid.
 3. Ask the students, "What examples did you see of this experiment in the book, *The Water Cycle at Work*? Where does this occur in nature?"

Water Cycle³

Explain to the students that water changes from one form into another naturally in the environment. To help students understand how water changes from one form into another in nature, make a water cycle using the following directions.

Materials:

- Large, clear, plastic bowl
 - Smaller container (like a butter tub)
 - Small weight (like a rock with a diameter the size of a quarter)
 - Clear plastic wrap
 - Large rubber band
 - Water
1. Take the clear, large plastic bowl and place the smaller container (butter tub) in the middle of the large bowl. Pour water into the large bowl, around the small container, but not inside the small container. Fill the large bowl until the water level reaches to about three-fourths of the height of the small container.

2. Place a piece of clear plastic wrap over the large bowl. Put the rubber band around the top of the bowl to keep the plastic wrap in place. Take the weight (rock) and put it in the middle of the plastic wrap. Place the “water cycle” inside the classroom in a sunny spot (like a windowsill).
3. The sun will heat the water in the large bowl so the water will evaporate, just like the water did in the **Changing States** activity. Here, the liquid form of water has changed into gas. The evaporated water (gas) will rise and condense on the inside of the plastic wrap. This means the water vapor has turned back into a liquid. The water droplets will slide down the plastic wrap until they are underneath the weight (rock). Then, they will fall into the small container. The small container collects the water that has been “recycled.”

The Earth’s Water Supply³

Materials:

- One-gallon container (such as a plastic ice cream bucket)
 - Clear bowl
 - Eye dropper
 - ½-cup measuring cup
 - Small plate
1. Discuss the Earth’s water supply using the information from the introduction.
 2. Display the following information on a poster or the chalkboard.

EARTH’S WATER SUPPLY

Oceans 97.3%

Ice 2.19%

Groundwater 0.5%

Soil Moisture 0.005%

Atmosphere 0.001%

Inland Lakes 0.018%

Rivers 0.000096%

To demonstrate how much of the Earth’s water supply is actually used, ask some students to help you with the next steps. (Make sure that the students understand this is just a demonstration and there is actually more water than this on earth.)

3. Pour water into a one-gallon container, such as a plastic ice cream bucket. This represents all the water on Earth.

4. Pour a half-cup of water out of the one-gallon container and into a clear bowl. The water in the bowl represents all of the fresh water on earth, which is less than three percent of the total water on earth. Fresh water is found in lakes, rivers, groundwater, ice, and living things. The 15 half-cups that are still in the one-gallon container represent salt water. We cannot use salt water without first removing the salt in a process known as desalination. Though research and technology are improving this process, it is still prohibitively expensive and often impractical.
5. With an eyedropper, drop one drop of water from the half-cup onto a small plate. This one drop represents the freshwater that is available for our use. This water is found in rivers and lakes. The rest of the water in the half-cup is deep groundwater, water bound up as soil moisture, biomass water, or water in the atmosphere.

Where Should I Grow It?⁵

1. Provide students with the *North Carolina Map* (attached to this activity sheet). Explain that the map shows each county.
2. Discuss how the climate of North Carolina changes as you travel east to west. See if your class can find any patterns in the types of crops that are grown in different regions. Test their knowledge by asking if they know what is the top crop grown in their county. Explain that some crops do best in hot, dry climates while others do best in mild, moist climates.
3. Using the [NC Department of Agriculture Ag Stats website](#) (full link in **Links** section), ask students to research the list of crops below and determine where they would be grown in North Carolina.
4. At the bottom of their map instruct students to write down the following crops then draw an arrow to a region on the map where they think those crops would grow well. Have students note the crops that are grown with the help of manmade structures, such as greenhouse/nursery crops, poultry, hogs, aquaculture, etc. Discuss why these crops need such structures, and why or why not that makes it easy for them to be grown outside of their climate limit. (For example, greenhouses and nurseries are across the state, but farmers still have to account for heating and cooling those structures, so it might be challenging and expensive to do so during certain seasons.)
 - a. Cotton
 - b. Christmas trees
 - c. Soybeans
 - d. Corn
 - e. Peanuts
 - f. Wheat

- g. Hogs/Pigs
- h. Cattle
- i. Poultry
- j. Greenhouse/Nursery
- k. Sweetpotatoes
- l. Cucumbers
- m. Strawberries
- n. Melons
- o. Aquaculture

What Fraction of Earth's Water is Usable?

This is an interesting way to see how much of the earth's land water is usable by humans. All you need is an apple and a knife.

1. Cut the apple into equal fourths. Set three of the four pieces aside. These three-fourths represent the part of the earth covered by ocean. Mark them ocean by labeling a paper towel or plate. The other fourth represents the part of the earth that is land not covered by water.
2. Cut the earth quarter into equal halves. One piece represents all the land that is too dry, too wet, too cold, too hot, or otherwise uninhabitable by people. The other piece, which is one eighth of the entire earth, is the land that is habitable by people.
3. Cut this one-eighth piece into four pieces. Set aside three of these pieces. The remaining piece represents the portion of the habitable land in which we are able to grow food.
4. This piece is worth $\frac{1}{32}$ of the whole. Cut off a thin slice. This tiny slice represents $\frac{3}{100}$ of 1% of the earth's surface. All of our drinking water comes from this tiny area!
5. Now turn your attention to the ocean part of the earth; the three quarters you put aside at the beginning.
6. Take one of the quarters and cut it in half. This piece, worth $\frac{1}{8}$ of the world's surface, represents the productive zones of the oceans, or parts of the ocean that support life.
7. Now take this $\frac{1}{8}$ and cut it into four equal pieces. One of these represents the productive area of the oceans along the Pacific coast of North America, one of the richest regions of the oceans.
8. Now take one of these pieces, which are worth $\frac{1}{32}$, and cut off a thin slice. This tiny slice represents the photic zone, the top 100 meters (300 ft.) of the ocean through which light can penetrate and support photosynthesis. Since most marine life depends in some way on photosynthesizing plants, most of the entire ocean's life is concentrated in this narrow surface region.

Questions:

1. Look at the reasons in #2 why some areas of earth may not be inhabitable by humans. List at least three areas of the earth that may fit into these categories.
2. What do you notice about the fraction of usable land and water versus the fraction of land and water that is unusable?

Links

- *Water in Agriculture* (pictures)
https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=225&search_term_lp=water%20cycle
- Wild Water Adventures (My American Farm Digital Game), scroll to bottom of the page
<http://www.myamericanfarm.org/classroom/games>
- *North Carolina Department of Agriculture Ag Stats Website*
<http://www.ncagr.gov/stats/general/overview.htm>

Sources

1. <https://www.epa.gov/sites/production/files/2017-02/documents/ws-ourwater-north-carolina-state-fact-sheet.pdf>
2. <https://deq.nc.gov/about/divisions/water-resources/drinking-water>
3. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=498&search_term_lp=water%20cycle
4. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=498&search_term_lp=water%20cycle
5. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=327&author_state=0&search_term_lp=water%20cycle
6. https://www.bpsma.org/uploaded/TeachingLearning/ScienceResourcesK-8/OtherResources/Grade_4_Science_Water_Cycle.pdf

K-5 Subject Areas

Reading, Speaking and Listening, Science, and Social Studies

Common Core/Essential Standards

Reading

- **RL.K.1** With prompting and support, ask and answer questions about key details in a text.
- **RL.1.1** Ask and answer questions about key details in a text.
- **RL.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
- **RL.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the **basis for** the answers.
- **RL.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RL.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
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- **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Speaking and Listening

- **SL.K.4** Speak audibly and express thoughts, feelings, and ideas clearly.
- **SL.1.4** Produce complete sentences to describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
- **SL.2.4** Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent and complete sentences.
- **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly in complete sentences at an understandable pace.
- **SL.4.4** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; adjust speech as appropriate to formal and informal discourse.
- **SL.5.4** Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; adapt speech to a variety of contexts and tasks.

Science

- **K.E.1.1** Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses.
- **1.E.2.1** Summarize the physical properties of Earth materials, including rocks, minerals, soils and water that make them useful in different ways.
- **1.L.1.1** Recognize that plants and animals need air, water, light (plants only), space, food and shelter and that these may be found in their environment.
- **2.P.2.1** Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling.
- **2.P.2.2** Compare the amount (volume and weight) of water in a container before and after freezing.
- **2.P.2.3** Compare what happens to water left in an open container over time as to water left in a closed container.
- **2.E.1.1** Summarize how energy from the sun serves as a source of light that warms the land, air and water.
- **3.P.2.2** Compare solids, liquids, and gases based on their basic properties.
- **3.P.2.3** Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water.
- **3.P.3.2** Recognize that energy can be transferred from a warmer object to a cooler one by contact or at a distance and the cooler object gets warmer.
- **3.E.2.1** Compare Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers).
- **5.P.2.1** Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff).
- **5.P.3.1** Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation)
- **5.P.3.2** Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications

Social Studies

- **K.G.1.2** Use globes and maps to locate land and water features.
- **K.G.2.2** Explain ways people use environmental resources to meet basic needs and wants (shelter, food, clothing, etc.).
- **1.G.1.1** Use geographic tools to identify characteristics of various landforms and bodies of water.
- **2.G.2.1** Give examples of ways in which people depend on the physical environment and natural resources to meet basic needs.

- **1.G.2** Understand how humans and the environment interact within the local community.
- **2.G.2** Understand the effects of humans interacting with their environment.



Cranberry Harvest



Soybean Field



Onion Field



Corn Field



Rice Field



Cattle



Chicken

