



Activity: Efficient Use of Water

Activity Overview:

In this activity, students take a closer look at water and the water cycle to learn more about growing crops for food. Students research the growing needs of a specific crop and identify the best regions in the U.S. to grow that crop based on their water needs. Students combine their findings to create a crop map of the U.S. Using this information, students build understanding of the importance of efficient use of water in producing food for consumers.

Activity Duration: 30 minutes

Next Generation Science Standards:

MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

ESS3.A: Natural Resources: Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.

Essential Questions:

- Why is water an important component in food production?
- Why are different regions of the U.S. more appropriate for some crops and not others?
- How do farmers make efficient use of available water to produce food?

Objectives:

Students will:

- Analyze the impact of the water cycle and rainfall on the kinds of crops that can be grown in different regions of the U.S.
- Evaluate the suitability of different regions of the U.S. for specific crops
- Explain how farmers in different regions of the U.S. make efficient use of available water to grow crops

Materials:

- Plant, if possible (If a live plant is not available, a picture of any plant will do.)
- Projector



- Water cycle image (To project)
 - Optional resource located at http://pmm.nasa.gov/education/sites/default/files/article_images/Water-Cycle-Art2A.png
- Crop Squares (Cut apart; one square per group)
- Blank U.S. map (One per student group)
 - Optional resource located at <http://www.50states.com/maps/usamap.htm>
- Computers or tablets (At least one per student group)
- Images of spray and drip irrigation systems (To project)
 - Optional resource located at http://ucanr.edu/blogs/CT//blogfiles/18294_original.jpg and http://ucanr.edu/blogs/CT//blogfiles/12632_original.jpg and https://growerssupply.files.wordpress.com/2012/07/drip-irrigation-system-110400_16-crop.jpg

Procedure:

1. Hold up a plant in front of the class, and ask students what it needs to grow. Students' correct answers should include sunlight, water, air and soil. Focusing on water, explain to students that today they will be taking a closer look at how water and the water cycle play an important role in growing crops for food.
2. Project the water cycle image and ask students to observe and discuss the diagram. Ask them to explain what two forces keep the water cycle in motion (sun and gravity).
3. To tap into students' prior knowledge, begin a discussion around water and rainfall. Ask them for their observations of the water cycle diagram and follow up with questions to guide the discussion around rainfall and water supply, such as the following:
 - What happens to rain when it hits the ground?
 - Do you know of areas of the country that receive a good deal of rain? Less rain?
 - What can towns or states do to increase their water supply if they do not get a lot of rain?
4. Once students seem comfortable with the water cycle diagram, divide them into groups of four and present them with the following scenario: "Your team has been hired by an agricultural firm to find the best location in the United States for growing crops based on precipitation. Your team will be given information about a specific crop and a blank map of the United States. Your team will have 15 minutes to conduct research about

the crop and identify the best region or regions of the U.S. for your crop based on the water needs of that plant.”

5. Cut out the squares of crop information below and give one square and one blank U.S. map to each group.
6. Instruct teams to research the different biomes found in the United States and the amount of rainfall that each biome receives. Teams will then label the blank map with the different regions suitable for growing their assigned crop. Possible websites for student research include:
 - The National Weather Service:
http://www.cpc.ncep.noaa.gov/products/Global_Monsoons/American_Monsoons/NAMS_precip_monitoring.shtml
 - NASA: <http://earthobservatory.nasa.gov/Experiments/Biome/index.php>
(Note: While these websites are recommended, please review the websites and tailor the list as needed based on student need.)
7. Instruct each group to share their findings with the class. As students listen to their peers’ reports, they should record the information about each crop on their own maps.
8. Ask the following questions to promote discussion around how farmers use of this kind of information to make efficient use of water when growing crops for food:
 - Why might a farmer in Arizona decide not to grow oranges as part of his main crop?
 - What regions in the U.S. are better suited for oranges or other citrus fruits?
 - Farmers can’t depend solely on rainfall to water their crops. Do you know of any ways farmers efficiently get water to their crops?
9. Show students images of spray and drip irrigation systems and explain that farmers use these types of systems to provide water directly to crops that need it. Have students discuss how systems like these might help regions that have limited rainfall.
10. Wrap up the activity by asking students to turn over their maps and describe in three or four sentences the following:
 - The importance of the water cycle in plant growth and development



- Two ways farmers use their understanding of the water cycle in their region to efficiently use water to grow crops. Students should use evidence from their research and the activity to support their claims.

Optional Extension:

For students who may be interested in learning about water around the world, host a discussion around the idea that countries all over the globe receive different amount of rainfall. Instruct students to compare and contrast countries with varying precipitation to see how the rainfall affects the nations' agriculture and daily lives. Examine the ways different countries address difficulties around getting adequate, clean water.



Crop Squares

<p style="text-align: center;">Beans</p> <p>Beans need 300-500 mm of water during their growing period. The growing period of beans is between 75 and 90 days long.</p>	<p style="text-align: center;">Corn</p> <p>Corn needs 500-800 mm of water during its growing period. The growing period for corn is between 80 and 110 days long.</p>	<p style="text-align: center;">Sorghum</p> <p>Sorghum needs 450-650 mm of water during its growing period. The growing period for sorghum is between 120 and 130 days long.</p>
<p style="text-align: center;">Citrus Fruits</p> <p>Citrus fruits need 900-1200 mm of water during their growing period. The growing period of citrus fruits is between 240 and 365 days long.</p>	<p style="text-align: center;">Soybean</p> <p>Soybeans need 450-700 mm of water during their growing period. The growing period for soybeans is between 135 and 50 days long.</p>	<p style="text-align: center;">Groundnut</p> <p>Groundnuts need 500-700 mm of water during their growing period. The growing period of nuts is between 100 and 130 days long.</p>

Source: <http://www.fao.org/docrep/u3160e/u3160e04.htm>