Learning Activity:

How Much Water Is in Your Lunch?

Activity Type	Analyzing statistics and graphing
Focus Areas	Math, science
Time Required	30–45 minutes

Overview

Around the world, human populations are increasing, and more people means more mouths to feed. The pressure on agriculture to increase productivity has had a negative effect on the environment. In order to produce more food, habitats are being destroyed, wildlife is being threatened, and resources—such as water—are being consumed at a faster rate than they can be replaced. This activity will introduce students to the global challenge of keeping up with food demand while also making sure that nature is protected. Students will create a pictograph to display data on the amounts of water required to produce familiar food items. By learning about the full environmental impact of growing food, students will gain the knowledge they need to make conscious choices that help conserve resources and protect the health of our planet.

Objective

At the completion of the activity, students should be able to:

- Provide examples of how water is used throughout the process of food production.
- Explain the current food crisis and how it's impacting species such as monarchs.
- Name several actions they can take to help prevent monarch habitat loss and reduce waste.

Subject and Standards

Common Core Standards: Math

- MP.4: Model with mathematics
- 3.OA.A.1: Interpret products of whole numbers; e.g., interpret 5x7 as the total number of objects in 5 groups of 7 objects each.
- 3.OA.A.3: Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities; e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
- 3.MD.A.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

Next Generation Science Standards

- 3-LS4-4 Biological Evolution: Unity and Diversity
  - Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
- 4-ESS3-1 Earth and Human Activity
  - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 5-ESS3-1 Earth and Human Activity
  - Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Materials Needed

- Paper
- Pencil
- Colored pencils

Vocabulary

- **Agriculture:** the process of farming soil, producing crops, and raising livestock
- **Consumption:** the act of using, typically referring to eating or drinking, especially in great quantity
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter
- **Habitat loss:** the disappearance of natural environments (required for plants' and animals' survival) due to harvesting for human consumption and/or clearing to make way for agriculture, housing, roads, pipelines, and other forms of industrial development
- **Pictograph:** a diagram representing statistical data with pictures
- **Pollution:** the act of contaminating an environment, especially with man-made waste
- **Runoff:** the portion of precipitation on land that ultimately reaches streams

A monarch butterfly colony overwinters in Michoacán, Mexico.

Activity Procedure

Part 1: Introduction and Preparation

- Begin the discussion by asking students where their food comes from. Although many may say the grocery store, remind them that food goes through a lot of stages before it ever reaches their plate. Crops that provide essential ingredients in our food products are grown, treated, stored, and transported before they're prepared for us to eat. Each of these steps requires a lot of resources, including land, people, fuel, and water—lots and lots of water. When considering how much water it takes to produce a food product, the amount polluted during each step should also be included, from the beginning of the process when the crops are grown all the way until the end, when it reaches the person eating the food item. Provide students with some background information on the role of water in the creation of food:
  - Water is used in a number of ways during the food production process. Water that falls as precipitation is absorbed by the soil and used by crops to grow. Water is then used by people for various agricultural and manufacturing steps, including crop irrigation, hydration for livestock, fuel for transportation that moves food from one location to another, and power for factories that make the food products.
  - In addition to being consumed, water is also polluted during each stage of food production. Both farms and factories produce pollution, which can end up in the local freshwater resources directly through a pipe or indirectly through runoff.
- Continue the discussion on water usage to introduce students to the current food problem facing our planet. We consume food at a rate of 1.6 times what Earth's resources (land, water) can naturally supply. In other words, based on how we produce food, what we eat, and the rate our population is growing around the world, we would need over one and a half Earth-like planets to support all of us comfortably. Ask students to predict how this could present a problem for the future. By the year 2050, the world's population is expected to be 9 billion and will require the resources of two Earth-like planets. We don't have two Earths; how will we provide food for everyone without using all of Earth's resources?

Part 2: Activity

In order to understand the impact of food production on our planet's natural resources, students will create a pictograph of the amount of water used to produce some popular food products.

- Display the following chart or distribute it as a handout for students to reference. This chart provides statistics on how many gallons of water are consumed and polluted in order to produce many popular food items. These numbers provide a glimpse into how much pressure each of these products has put on Earth's freshwater resources. In order to give students a visual image of a gallon unit of measurement, it may be helpful to display an empty gallon container for reference.
- Allow students several minutes to review the data. Ask them if they notice any trends, such as what types of food require the most water in comparison to the least; animal products generally use more water to create than crop products, primarily due to the water needed to provide the animal with food and hydration.

Food Item	Gallons of Water Used
1 hamburger patty	460
1 small cheese pizza	333
1 chocolate bar	200
1 cooked chicken breast	197
1 slice of ham	134
1 cup of cooked rice	132
1 glass of milk (8 ounces)	67
1 egg	53
1 cup of orange juice	49
1 peach or nectarine	37
1 corn on the cob	29
1 salad (with tomato, lettuce, and cucumber)	24
1 slice of cheese	24
1 banana	24
1 apple	22
1 orange	21
1 slice of bread	21
1 small bag of chips	12

Source: waterfootprint.org

- Instruct students to choose several items they eat from the chart; perhaps have them choose foods that they would have for lunch, such as a ham and cheese sandwich.
- Distribute paper and coloring utensils. Ask students to use statistics shown in the chart for the foods they selected to create a pictograph. Using what they know about graphing, remind them to include a title (an example could be "Amount of Water Used to Make My Lunch"), labels, and a legend that displays the symbol(s) they decided to use and the amount that each will represent.
- As students choose their items to include in their pictograph, remind them that they will need to add up the number of gallons for each of the items on the list.
  - For example, if they eat a ham and cheese sandwich, they will need to total the number of gallons needed for 2 slices of bread + ____ slices of ham + ____ slices of cheese.

AMOUNT OF WATER USED TO MAKE MY LUNCH

Key: 1 = 10 gallons

LUNCH ITEM	NUMBER OF GALLONS OF WATER USED
HAM AND CHEESE SANDWICH	
BANANA	
BAG OF CHIPS	
GLASS OF MILK	

Part 3: Discussion and Assessment

- Call for student volunteers to share their pictographs, noting which of their favorite foods uses the largest amount of water.
- Discuss with students the additional impacts food production has on our environment, such as the release of greenhouse gases and the impact on land use. Greenhouse gases are emitted from transportation vehicles and factories during the food production process; these gases collect in our atmosphere and are the main drivers of climate change. In addition, lush grasslands that make up the Northern Great Plains of the United States are being plowed and converted to grow crops for agriculture, to support the increasing human need for food. These grasslands are made up of rich soil and vegetation that species, including monarch butterflies, rely on for food and habitat. By plowing and converting the grasslands, we are changing the ecosystems and impacting the plants and animals that can thrive there. Species such as monarchs, which depend on milkweed plants found in grasslands to lay their eggs and feed their young, lose this essential vegetation and are forced to search for alternative habitat.
- Finish the activity by discussing ways in which organizations like WWF and students can help conserve water and land by changing food practices.
    - WWF is working to improve food production practices to grow more food without damaging the natural surroundings in order to prepare us for the increasing demand for food in the future.
    - Students can help conserve water and land by:
        - Avoiding wasting food. Wasting food means you're wasting everything it took to make that food, including water. Take only as much food as you think you'll eat, and repurpose leftovers by eating them another time or sharing them with a friend.
        - Eating a balanced diet and following nutritional guidelines. Manufacturing products made of ingredients like beef, chicken, or pork tend to require much more water than those made of vegetables and fruits.
        - Planting milkweed native to your region. By incorporating milkweed into your home or school garden, you're providing monarch butterflies with a critical resource to lay their eggs and provide food for their future baby caterpillars.

Extended Learning Options

- Use this activity as a precursor to lead into a discussion on renewable versus nonrenewable resources. Ask the students what type of resource they think water is classified as. Despite the massive role water plays in the everyday lives of people and wildlife, it is a limited resource. This is why it's even more important to make conscious choices regarding our water use.
- Tie this activity in to another from the Monarch Butterfly Toolkit, such as the "Eating Our Planet" language arts activity, to have students learn more about the effect food has on the environment.
- You can also have students calculate the amount of food that gets wasted in their school by using activities in the Food Waste Warrior Toolkit.
- Use a tablet or smartphone (if available) to download the WWF Together app. Encourage students to explore the monarch segment to learn more about the impact of food production on butterfly habitat.
- Start a class fundraiser to protect monarch butterflies and other wildlife and their habitats using WWF's online fundraising tool, Panda Nation. Learn more at pandanation.org.

Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Video:** Change the Way You Think about Food—a short video that outlines the current problem of overconsumption and poses a solution around altering agricultural practices
- **Video:** Change the Way You Think—uses a morning coffee as an example to describe the need to do more with less in order to conserve our natural resources
- **Article:** The Plate-Planet Connection—discusses how the food we eat impacts the wildlife we care about
- **Article:** Hello World: Our Food, Our Wildlife, Our Responsibility—short bios of other wildlife affected by our food system
- **Web Feature:** Waterfootprint.org—a tool for comparing how much water is used to make other food products and for exploring how to reduce your water usage

For more fun classroom activities with a focus on wild species and conservation, visit wildclassroom.org.