Science Sustainability Sleuths Day 7

DiscoveryCube

This guide accompanies
Science Sustainability Sleuths Day 7

PRIOR TO TEACHING

Subject
Watersheds

Program Length
45 minutes – 1 hour

Program Objective
When it rains, water flows past our homes and schools on its way to oceans and lakes. Build a watershed model of a fictional town to see how the water flows and hear from a local scientist who specializes in monitoring the health of our watersheds.

Next Generation Science Standards
3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.

4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.

What I Need Today

- [ ] large, deep baking dish
- [ ] cups and/or drinking glasses (various sizes)
- [ ] bowls (various sizes)
- [ ] trash bag
- [ ] small toys that can get wet, such as hot wheel cars, plastic fruit, LEGOs, or blocks
- [ ] foil (optional)
- [ ] spices or powders, such as cocoa or drink mix (whatever you have in the kitchen)
- [ ] food coloring or other colored liquids found in the kitchen
- [ ] spray bottle filled with water
- [ ] small towel (optional)
- [ ] graph paper or copy paper
- [ ] pen
- [ ] ruler
- [ ] scissors
- [ ] petroleum jelly, such as Vaseline
- [ ] butter knife, craft stick, or small spatula
- [ ] cardstock, index card, paper plate, or cardboard
- [ ] tape

Vocabulary

Watershed – The area of land containing all surface and groundwater that drain to the same location.

Contaminates – Something dangerous, dirty, or impure.

Fertilizer – A substance, such as manure or a special chemical, that is added to soil to help plants grow.

Drainage Basin – Another name for a watershed.

Pollution – The collection of contamination in air, water, or on land. Trash, chemicals, and other harmful substances can all contribute to pollution.

Molecule – Two or more atoms joined tightly together.

Particles – Tiny bits of matter – in fact, the smallest possible unit of matter. Atoms are made up of particles.

Greenhouse Gases – Various gases in the atmosphere that trap heat, but let sunlight pass through.

Asthma – A condition that causes breathing problems, such as coughing, wheezing, or shortness of breath.

Instructor Prep

☐ In advance, send students a list of the materials needed for today's lesson.

PROCEDURE

What We'll Learn

You may live downstream from another part of your watershed, and the water that flows past your home or school will probably go toward someone else's home. You can do your part to keep the water clean by picking up trash and being careful not to over fertilize plants.

What Will Happen?

Scientists ask questions and make predictions before they start investigating. Have your students hypothesize: where will the water in my watershed model gather and "pool"?

- ○ In the highest parts of the model
- ○ In the middle parts of the model
- ○ In the lowest parts of the model

What to Do

REVIEW - DAY 6: WATER CONSERVATION

Last time you met, you learned about water conservation, your water footprint, and why it's important to save water. Today, you'll learn how water travels and why it's important to keep the water near your home or school clean.

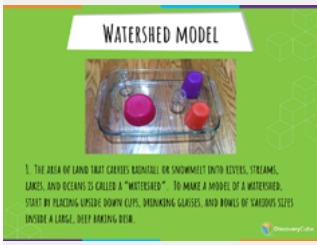
VIDEO - SCIENTIST SPOTLIGHT: WATERSHEDS WITH MO WISE

To start learning about watersheds, first watch *Scientist Spotlight: Watersheds with Mo Wise*, a special scientist spotlight video: *https://vimeo.com/501811751/3b659f0d2e*

Reflect on the video: what did your students learn?

EXPERIMENT - WATERSHED MODEL

1) The area of land that carries rainfall or snowmelt into rivers, streams, lakes, and oceans is called a "watershed". To make a model of a watershed, start by placing upside down cups, drinking glasses, and bowls of various sizes inside a large, deep baking dish.

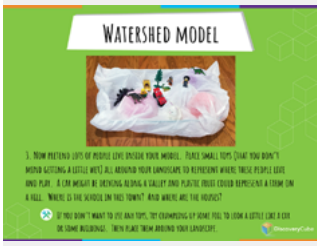


2) Open the trash bag and lay it flat over the top of all your items in the pan. This now represents the peaks of the mountains and hills with valleys in between.

Tips & Tricks: To help the trash bag spread out over the entire model, try cutting off the bottom seam of the bag.

3) Now pretend lots of people live inside your model. Place small toys (that you don't mind getting a little wet) all around your landscape to represent where these people live and play. A car might be driving along a valley and plastic fruit could represent a farm on a hill. Where is the school in this town? And where are the houses?

Tips & Tricks: If you don't want to use any toys, try crumpling up some foil to look a little like a car or some buildings. Then place them around your landscape.



4) Use spices or other colored powders (such as cocoa or drink mix) from your kitchen to represent contaminates or trash left behind by the homes and businesses. You could sprinkle a little cinnamon near a home to represent the pet waste someone didn't pick up. Or put a little Italian seasoning near the school, which could be the remains of a lunch someone forgot to throw away.

5) Kitchen liquids can represent liquid contaminates. You just need a tiny bit – only a drop or two of each liquid will work great. Try adding a small pool of soy sauce near the car to represent leaky oil and a drop of green food coloring near the farm to represent the extra fertilizer the farmer used to grow the crops.

Tips & Tricks: Use whatever items you already have and think creatively about contaminates people and business might leave behind. What can you find in your kitchen that could represent some of these contaminates?

6) Now pretend a giant rain cloud makes its way to the town. Use a spray bottle to represent the rain coming down.

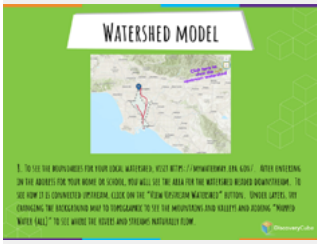
Tips & Tricks: If you don't have a spray bottle, try wetting a small towel and wringing it out over the model of the town. You may need to repeat this several times until the water begins to pool.

7) Examine your watershed model. What happened to all the contaminates? What pathway did the water take? Where did it start to pool?

Fun Fact: A watershed pathway is sometimes called a drainage basin. Unless you live on the highest point of a mountain, you probably live downstream from something else. When it rains, the water you see dripping down your window or flowing through the street is making its way toward the lowest point, which is probably a lake, the ocean, or your local water treatment plant. As it flows, the water picks up any contaminates it encounters along the way. Plants, animals, and people use this water for food, drink, and recreation, so it's important to keep it clean. You can do your part by picking up trash and pet waste and making sure you don't over-fertilize your plants or let oil drip from your car.

8) To see the boundaries for your local watershed, visit https://mywaterway.epa.gov/. After entering in the address for your home or school, you will see the area for the watershed headed downstream. To see how it is connected upstream, click on the "View Upstream Watershed" button. Under layers, try changing the background map to topographic to see the mountains and valleys and adding "Mapped Water (all)" to see where the rivers and streams naturally flow.

Tips & Tricks: This website may not load using the Chrome web browser.



PREP FOR NEXT WEEK - AIR QUALITY EXPERIMENT

Next week, you'll be learning about air quality. Start the experiment now so you can analyze your results next week.

1) Air is in constant motion around the Earth, absorbing water from lakes, rivers, and oceans, and picking up pollutants. Pollution can come from sources that are either natural (forest

fires, volcanic eruptions) or manmade (vehicles, factories). As the wind blows, it moves these water molecules and pollutants around, constantly changing the quality of our air. When there are a lot of tiny particles or greenhouse gasses (such as carbon dioxide and sulfur) in the air, it can make it difficult for us to breathe, especially for someone with asthma. This experiment will help you visualize the quality of the air you breathe. Start by gathering graph paper, a ruler, and a pen (if you don't have graph paper, you can use copy paper instead).

2) Create a 10x10 square grid. If you are using graph paper, draw a boarder around 100 boxes: 10 along the top, 10 along each side, and 10 along the bottom.

Tips & Tricks: If you do not have graph paper, you can create your own 10x10 square grid using copy paper and a ruler. Try making each box ¼ inch square.

3) To compare the outdoor and indoor air quality around your home or school, create a second 10x10 square grid, making sure you leave room to cut out both grids.

4) Cut out your square grids, leaving at least a ½ inch boarder on all sides.

5) Tape the grids to cardstock, index cards, paper plates, or cardboard, making sure they are securely attached on all sides.

6) Label each experiment with their intended location, such as "inside" and "outside".

7) Use a dull bread knife, craft stick, or small spatula to slather a smooth and thick amount of petroleum jelly (a common brand name is Vaseline) over each grid, making sure the entire grid is well coated.

8) Place each experiment where they will not be disturbed for several days. You might consider placing an indoor experiment on top of a bookshelf to keep it out of reach. Secure your

outside experiment so it does not blow away by placing a rock or a furniture leg on top (just make sure this does not touch the petroleum jelly). Keep an eye on the weather over the next couple of days – if it looks like it is going to rain, end the experiment early and bring the outdoor sample back inside.

Tips & Tricks: Make sure you tell people you are doing this experiment so they don't throw it away. You can always write "science experiment in progress" on your cardstock to help them remember.

CONCLUSION

What I Discovered

To complete the Water Wise badge, have your students reflect on what they discovered. We would love to see pictures of their watershed models. Please email pictures to *educationemail@discoverycube.org*.

For Next Week

Have your students gather these supplies:

- [ ] pen
- [ ] graph paper or copy paper
- [ ] fan or outside wind
- [ ] string or ribbon
- [ ] wooden skewer or sharpened pencil
- [ ] disposable straw (large enough to fit over the skewer/pencil)
- [ ] paper towels
- [ ] aluminum foil
- [ ] small weights, such as washers or beads
- [ ] index cards, thicker paper, playing cards, or spam mail credit cards
- [ ] magnifying glass (optional)
- [ ] scrap paper (optional)
- [ ] toothpicks (optional)
- [ ] ruler
- [ ] tape
- [ ] scissors