



Sustainability Science Sleuths

Day 7



This guide accompanies
[Sustainability Science 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

FROM SCIENCE KIT:

Per Student:

graph paper
craft stick
2 index cards (4"x6")

Per Classroom:

spray bottle
petroleum jelly

Per Group of 3-4 Students:

large aluminum baking dish (9"x12")
16 oz. deli containers (3 per group)
8-10 oz. cups (2 per group)
4 oz. deli containers (3 per group)
1 oz. deli containers (1 per group)

trash bag
foil
dusting of powdered chocolate
few drops of food coloring
scotch tape

SUPPLIED BY TEACHER/STUDENTS:

tap water (in spray bottle)
pen
ruler
scissors



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

Divide students into groups of 3 or 4 students per group for today's activity.

Divide the petroleum jelly between the 4 oz. deli cups so each group has easy access to the petroleum jelly.

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

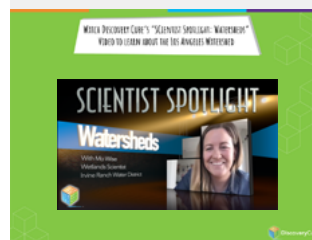
Last time you met, you learned about water conservation, your water footprint, and why it's important to save water. Today, you'll learn how water travels and why it's important to keep the water near your home or school clean.



VIDEO - SCIENTIST SPOTLIGHT: WATERSHEDS WITH MO WISE

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

Reflect on the video: what did your students learn?





ACTIVITY - 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, have your groups place upside down bowls and cups of various sizes inside their 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. Crumple up some foil to look a little like a car or some buildings. Then place these around the landscapes to represent where people live and play. Where are the roads for the cars? Where is the school in this town? And where are the houses?

4) Use powdered chocolate to represent contaminates or trash left behind by the homes and businesses, such as pet waste someone didn't pick up or the remains of a lunch someone forgot to throw away at school.

5) Food coloring can represent liquid contaminates. You just need a tiny bit – only a drop or two of a color will work great. Try adding a little yellow near the car to represent leaky oil and a drop of green food coloring near a home to represent the extra fertilizer the gardeners used. What other contaminates might be found in your town?

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.

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.

WATERSHED MODEL



2. OPEN THE TRASH BAG AND LAY IT FLAT OVER THE TOP OF ALL YOUR ITEMS ON THE PAN. THIS NOW REPRESENTS THE PEAKS OF THE MOUNTAINS AND HILLS WITH VALLEYS IN BETWEEN.

💡 TO HELP THE TRASH BAG SPREAD OUT OVER THE ENTIRE MODEL, TRY CUTTING OFF THE BOTTOM SEAM OF THE BAG.

WATERSHED MODEL



3. NOW PRETEND LOTS OF PEOPLE LIVE INSIDE YOUR MODEL. FOLD SMALL PEEPS TOUGH TOUGH WHEN CREATING A LITTLE WHEEL TO REPRESENT YOUR LANDSCAPE TO REPRESENT WHERE THESE PEOPLE LIVE AND PLAY. A CAR MIGHT BE CREATED USING A GALLET AND PLASTIC BEANS COULD REPRESENT A TOWN OR A HILL. WHERE IS THE SCHOOL IN THIS TOWN? AND WHERE ARE THE HOUSES?

💡 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.

WATERSHED MODEL



4. USE POWDERED CHOCOLATE TO REPRESENT CONTAMINATES OR TRASH LEFT BEHIND BY THE HOMES AND BUSINESSES, SUCH AS PET WASTE SOMEONE DIDN'T PICK UP OR THE REMAINS OF A LUNCH SOMEONE FORGOT TO THROW AWAY AT SCHOOL.

WATERSHED MODEL



5. FOOD COLORING CAN REPRESENT LIQUID CONTAMINATES. YOU JUST NEED A TINY BIT – ONLY A DROP OR TWO OF A COLOR WILL WORK GREAT. TRY ADDING A LITTLE YELLOW NEAR THE CAR TO REPRESENT LEAKY OIL AND A DROP OF GREEN FOOD COLORING NEAR A HOME TO REPRESENT THE EXTRA FERTILIZER THE GARDENERS USED. WHAT OTHER CONTAMINATES MIGHT BE FOUND IN YOUR TOWN?

💡 BE CAREFUL WHEN YOU ADD ANY FOOD COLORING NEARLY ABOUT IMPERMEABLE FOLDS AND DETAILS THAT CAN TRAP IT. YOU CAN TRY TOON ON YOUR FINGERS TO COLOR BETWEEN THEM IF THAT HAPPENS!

WATERSHED MODEL



6. NOW PRETEND A GIANT RAINY CLOUD MAKES ITS WAY TO THE TOWN. USE A SPRAY BOTTLE TO REPRESENT THE RAIN COMING DOWN.

💡 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 contaminants? 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 contaminants 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.



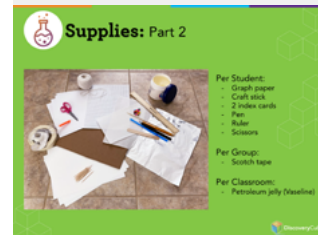
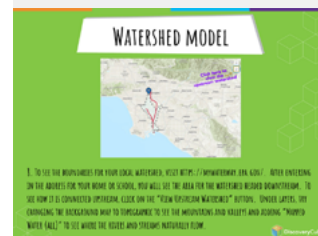
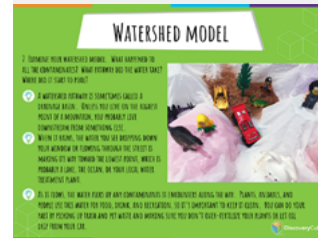
Tips & Tricks: This website may not load using the Chrome web browser.



PREP FOR NEXT TIME - AIR QUALITY EXPERIMENT

Next time, you'll be learning about air quality. Start the experiment now so you can analyze your results next time. Note: The longer the experiment can be left in place, the more data you will be able to collect.

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 $\frac{1}{4}$ 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 $\frac{1}{2}$ inch boarder on all sides.

5) Tape the grids to index cards 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 craft stick 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. 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 furniture leg on top (just make sure this does not touch the

AIR QUALITY PREP

2. AS THE WIND BLOWS, IT MOVES THE PARTICLES AND POLLUTANTS THROUGH, EFFECTIVELY CLEANING THE QUALITY OF OUR AIR. WHEN THERE IS A LOT OF TRUCK TRAFFIC OR BURNING GRASS EACH IS COMMON SOURCE AND SITUATED ON 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).



AIR QUALITY PREP

1. CREATE A 10x10 SQUARE GRID. IF YOU ARE USING GRAPH PAPER, DRAW A BORDER AROUND 100 BOXES: 10 ALONG THE TOP, 10 ALONG EACH SIDE, AND 10 ALONG THE BOTTOM.

2. TO MAKE YOUR OWN 10x10 SQUARE GRID USING COPY PAPER AND A RULER, TRY MAKING EACH BOX $\frac{1}{4}$ INCH SQUARE.

AIR QUALITY PREP

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.

AIR QUALITY PREP

4. CUT OUT YOUR SQUARE GRIDS, LEAVING AT LEAST A $\frac{1}{2}$ INCH BORDER ON ALL SIDES.

AIR QUALITY PREP

5. TAPE THE GRIDS TO INDEX CARDS, CARDBOARD, PHOTO PAPER, OR CONSTRUCTION PAPER, MAKING SURE THEY ARE SECURELY ATTACHED ON ALL SIDES.

AIR QUALITY PREP

6. USE A CRAFT STICK 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.

AIR QUALITY PREP

7. PLACE YOUR EXPERIMENT WHERE THEY WILL NOT BE DISTURBED FOR SEVERAL HOURS. YOU MIGHT CONSIDER PLACING AN INDOOR EXPERIMENT ON TOP OF A BOOKSHELF TO KEEP IT OUT OF REACH. SECURE YOUR OUTSIDE EXPERIMENT TO MAKE SURE IT DOES NOT BLOW AWAY BY PLACING A ROCK OR FURNITURE LEG ON TOP (JUST MAKE SURE THIS DOES NOT TOUCH THE EXPERIMENT). YOU MAY ALSO WANT TO LABEL EACH GRID WITH ITS INTENDED LOCATION (INDOOR OR OUTDOOR).

8. MAKE SURE YOU WILL BE ABLE TO VISIT YOUR EXPERIMENT AT THE END OF THE DAY TO CHECK FOR ANY CHANGES. YOU MAY WANT TO TAKE A PHOTO OF YOUR EXPERIMENT AT THE END OF THE DAY TO DOCUMENT ANY CHANGES.





petroleum jelly). Note: the longer this experiment can be left in place, the more data you will be able to collect.



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 index card to help them remember.

CONCLUSION

What I Discovered

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



Supplies for Next Time

FROM SCIENCE KIT:

Per Student:

air quality experiments from last time
graph paper
string or ribbon (about 12" long)
2-4 sheets of paper towels

Per Group of 3-4 Students:

magnifying glass
tape
foil (about 12" in length per student)
2-4 index cards
wooden skewer
2-3 beads
disposable straw
5-10 toothpicks

SUPPLIED BY TEACHER/STUDENTS:

pen
fan or outside wind
ruler
scissors

