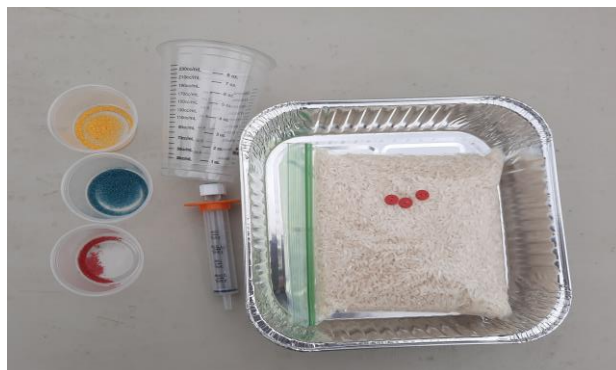




Modeling Pollution in a Watershed

- Supplies:**
- ❖ 1 9x9 Aluminum Tray
 - ❖ 3 cups of uncooked rice
 - ❖ 3 colors of sanding sugar
 - ❖ 3 small objects, such as buttons
 - ❖ 1 syringe
 - ❖ 1 plastic beaker or large cup
 - ❖ 3 small plastic cups
 - ❖ Water



Time: 30 – 45 minutes

Standards of Learning: **4.1** The student will demonstrate an understanding of scientific and engineering practices by developing and using models.

4.3 The student will investigate and understand that organisms, including humans, interact with one another and with the nonliving components in the ecosystem.

4.9 The student will investigate and understand that Virginia has important natural resources.

Life Skills: Responsible Citizenship
Critical Thinking
Learning to Learn

5 C's: Civic Responsibility
Communication
Creative Thinking

Vocabulary: **Ecosystem:** A community of different living things, including plants and animals, that interact with each other and the area where they live.

Elevation: How high something is above sea level. For example, if you are hiking and go from a valley to the top of a mountain, your elevation gets higher as you go up the mountain. That is called an increase in elevation.

Groundwater: Water that is underground and cannot be seen from the surface. People can reach groundwater by using a well that has a pump to bring the water to the surface. Groundwater is different from water in lakes, rivers, streams, or oceans, which is often called surface water.



Pollutant: A material that can hurt an ecosystem or natural area. Pollutants can include pesticides, fertilizer, trash and litter, chemicals, bacteria, and sediment.

Pollution: Pollution occurs when pollutants get into a natural area and cause harmful effects to the natural area.

Watershed: An area of land where water flows to a specific place, such as a river or the ocean. When rain falls in a watershed, it will eventually end up in that body of water.

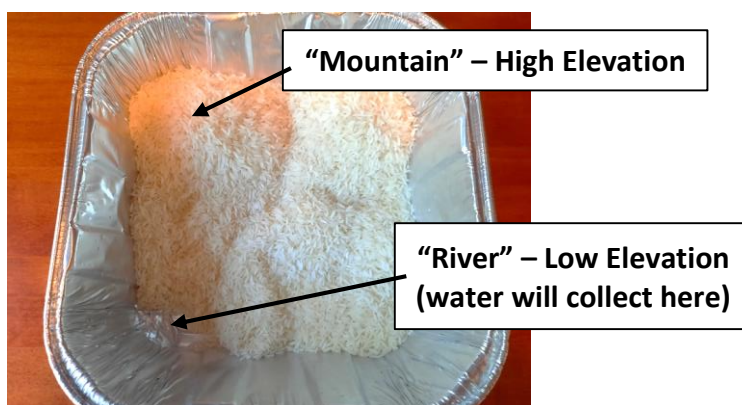
Background: A watershed is an area where water that falls as rain or snow and moves to a specific stream, river, lake or ocean. Any place on Earth is part of a watershed. Activity in one part of a watershed can impact other areas of the watershed, even if these areas are very far away on a map. Pollution in one area of a watershed can impact other parts of a watershed. Pollution can even impact water that is naturally found underground, known as groundwater. Groundwater is often used for drinking water and can be more difficult to reach than the water found in rivers, lakes, and streams.

Some common pollutants are pesticides, fertilizer, trash and litter, chemicals, bacteria, and sediment. Pesticides and fertilizers are helpful and are very important for food production and agriculture, but if people use them without following the instructions, the pesticides and fertilizers can get into streams and rivers and can hurt plants and animals that live in the water. Chemical pollutants can be common substances that you might see every day. For example, people use things like paint and gasoline often, but if they are not careful and they dump extra paint or gasoline outside, the paint and gasoline can get into rivers and streams and the water can become polluted. Many pollutants, such as bacteria, cannot be seen with your eyes because they are colorless. Instead, scientists collect water samples and test the samples in a lab to detect pollutants. You can look at the last page of this activity for more information about pollutants. In this activity, you will create a model to see how pollution in one area can impact an entire watershed.

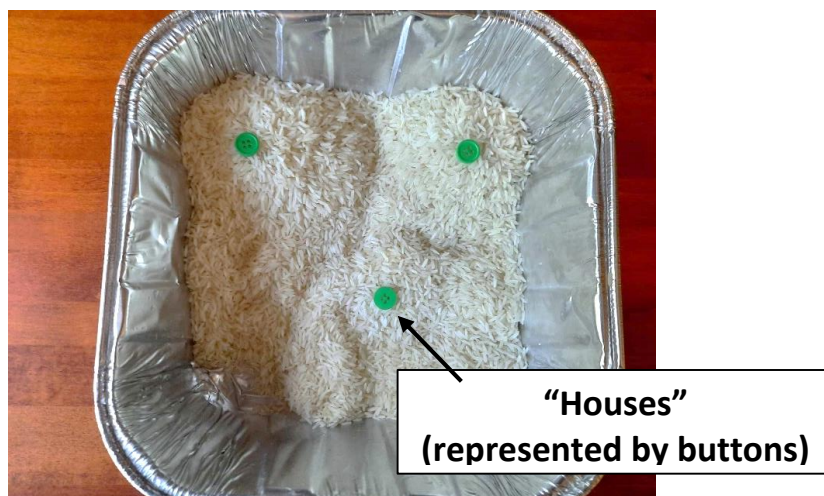
Project Goal: Build a model of a watershed and add pollutants to see how pollution in one small area can impact the entire watershed.

What to Do:

1. Gather your supplies: colored sugar sprinkles, rice, syringe, beaker, and aluminum container.
2. Fill the beaker with clean water.
3. Move the rice around in the aluminum tray to design a landscape with higher and lower elevation, like hills and valleys. Leave one corner of the tray empty of rice; this corner represents an area of lower elevation, like a river or lake.



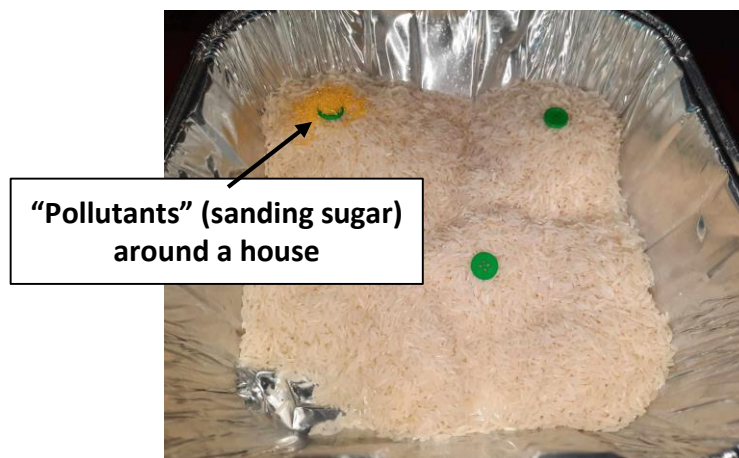
4. Add 3 objects that will represent houses in your model. These objects can be rocks, buttons, small plastic toys, or anything that can get wet.



5. Pour water over your model with the beaker. This represents rain. Pour enough water so that about 1/2 of an inch of water collects in your river. If there is no water collecting in your river, you may have to change the landscape so that one area is higher than the other.



6. Observe the water in the pan (observe means to look at carefully and notice what you see). What does the water look like?
7. Now sprinkle several pinches of sanding sugar (pollutants) around one of the houses. This sanding sugar represents fertilizer or pesticides that people might use on their lawn, or something like paint or gasoline that people might dump on the ground.

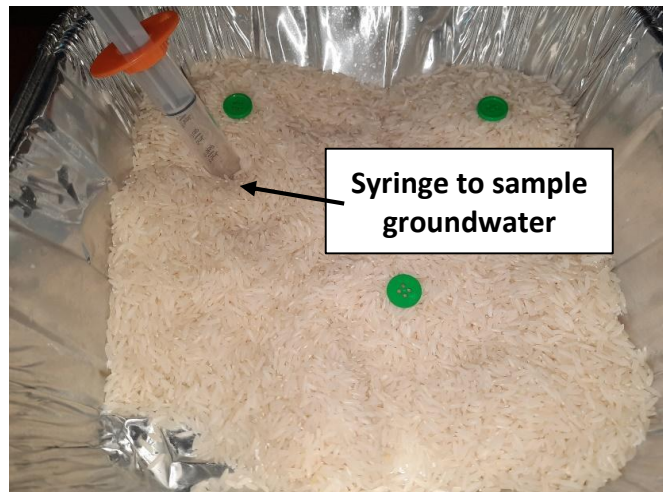


8. Pour water over the model with the beaker until most of the sanding sugar has been washed away. This simulates rain. The water in the river should start to change color as it is polluted.
9. Sample the water in the river using the now empty plastic sugar cup. Observe the sample. What does the water look like?
10. Repeat steps 6-8 with a different color of pollutant at another house in the watershed.
11. Now you can try to sample the groundwater so you can observe it. Sprinkle pollutants around a house in your model. Then pick a location just downhill



from your pollution site. Push the syringe to the bottom of the tray and try to get a water sample. Don't worry if it doesn't work the first time, keep trying!

How to use a syringe: make sure the plunger on the top is down as far as it will go before you put the syringe into the rice. Once the syringe is touching the bottom of the tray, pull up on the plunger as high as it will go. Then remove the syringe from the rice and look at the water inside.



12. Compare all of your samples and answer the Reflect and Apply questions below.

Reflect:

Observe all your samples. How did the water change as more pollutants were added to the watershed?

How did pollution in one small location, like a house, impact the rest of the watershed?

How did the elevation affect where the pollution ended up? Did the pollution always travel downhill?

How did the pollution affect the groundwater? Why did the water move underground when it started on the surface?





Apply: Why is it important for people to know about pollution in a watershed?

What do you think would happen if your watershed had plants? Can you think of any other ways to reduce pollution?

Do you know which watershed you live in? Take a look at this map to find out:

<https://www.dcr.virginia.gov/soil-and-water/document/wshedsclr.pdf>

Going Further: What can you do to reduce pollution in your watershed? (Hint: even picking up trash and litter helps!)

Groundwater: Water moves underground because of gravity, a force that pulls all matter to the center of the Earth. Water can move through very small openings and end up deep underground. Another factor that causes water to move underground is called **permeability**. Permeability is a measure of how easy it is for water to move through a substance. For example, it is easier for water to move through loose dirt than it is for water to move through concrete, so dirt is more permeable. Certain types of rocks are more permeable than others, so water can move easily through permeable rocks and end up underground. You can visit this website for more information about groundwater:

- <https://www.groundwater.org/get-informed/basics/whatis.html>

Pollutants: There are many types of pollutants. You can visit these websites to learn more about water pollution:

- <https://www.britannica.com/science/water-pollution>
- <https://www.nrdc.org/stories/water-pollution-everything-you-need-know>

Watersheds: If you want to learn more about watersheds and some of the problems that they face, you can visit these websites for more information:

- <https://www.noaa.gov/education/resource-collections/freshwater/watersheds-flooding-and-pollution>
- <https://www.epa.gov/environmental-topics/water-topics>

