Reducing Soil Erosion

How do we keep land healthy?

Introduction (~15 minutes)

Take a close look at the pictures on the right.
What do you see happening in each picture?
Why do you think this is happening?

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What do the three pictures have in common?
How are they different?

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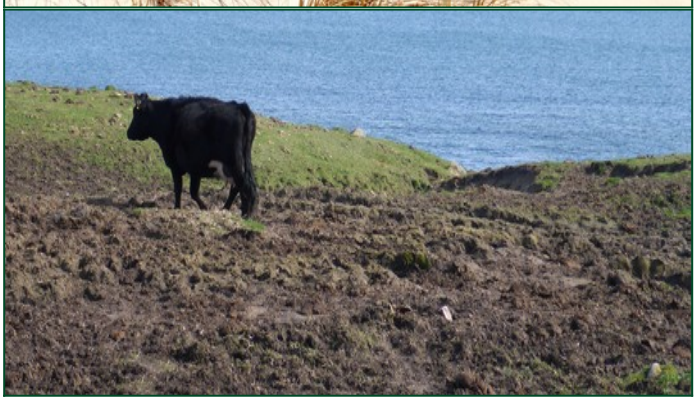

Each of the above photos shows erosion. Do an Internet search to learn more about erosion.

Be prepared to write down your definition and where you found your information on the next page. (If you don't have Internet access, ask teachers or other adults to help you come up with a definition.)

It's always a good idea to use several sources. This lets you compare the information and ideas from each source. If multiple sources give similar information, there is a better chance the information is true. You can also merge the different views. This lets you create more well-rounded knowledge.

My definition of erosion:

_____

_____

_____

Source 1:

_____

Source 2:

_____

Source 3:

_____

Explore (~50 minutes)

For billions of years, natural forces such as wind, water, and ice have shaped the land on Earth. Now it's your turn to see erosion at work!

To begin your experiment, find a container with deep sides and fill it about halfway with sand. Add water and mix it into the sand until the sand is wet enough to shape.

Pile all the sand on the end of the container opposite the hole. Slope the sand down to the end of the container with the hole. You have just made your hill. It will be the starting shape each time you begin a new step in your experiment.

On the right, draw pictures showing what your container looks like with the sand in the starting position.

Let's look at the impact of water erosion. We are going to pour water into the sandbox at the top of the hill and collect the water and sand that flow out through the hole in the bottom. Will measuring the amount of *sand* or *water* that comes out tell us more about erosion?

_____

Prepare one cup to collect the water that will flow out of the hole at the end of your box. You may need to press the cup against the box to avoid losing sand and water, but be sure not to lift the box.

Use one cup filled with about 1 cup (8 fluid ounces) of water to pour water onto the top of your hill. Pay attention to how you pour—you will need to pour the same way every time.

Explore Materials List

- A shoebox-sized waterproof container with a ¼" hole drilled at the base (to allow outflow of water)
- Sand
- Water
- 2 See-through cups for pouring & collecting
- Other materials to simulate erosion prevention

Top View

Side View

Record your observations after this first trial in the space below. Draw a top and side view as before, but also note how much sand was collected. (Remember, the amount of sand tells us more about the movement of soil than the amount of water.)

Reshape your hill and repeat your experiment. This time you can use your collection cup as your pouring cup, and the pouring cup from the last experiment can be used to collect. You may add a little water to your cup to keep its level the same. Record your observations in the space below. Scientists use multiple trials to ensure the results will be the same every time. If the results are different, scientists will look for an explanation.

Were your results similar in your two trials? If not, you will want to repeat your experiment one more time to be sure you know what to expect as we test a method to reduce erosion.

Sand Only, Trial 1
Top View
Side View
Amount of Sand Collected

Sand Only, Trial 2
Top View
Side View
Amount of Sand Collected

When soil erodes, it becomes more difficult to grow plants. It can take decades for soil to recover if too much is washed away.

There are many ways people try to reduce soil erosion. Sometimes people build walls to hold back soil. Short-rooted grasses and deeper-rooted trees and bushes can help hold soil in place. Piping and irrigation systems can also be used to redirect water so it doesn't erode soil.

Let's see if we can reduce the amount of erosion in our sandbox by trying one of these solutions. You can also try other solutions you think of.

Walls and other structures can be built using craft sticks. Grass can be simulated using green scouring pads. (Lawn grasses have a very shallow root system.) Deeper-rooted plants can be simulated with pads from a hair brush. Pipes can be simulated with straws.

Reshape your hill, and set up your way to limit erosion. Remember that as scientists, we must carefully control our experiment. Pay attention to where and how your wall, plants, or pipes are placed. To ensure accurate results, we also want to pour water from the same height and at the same speed into the same spot.

Conduct your experiment as you did before, and then repeat it. Record your results below as before.

Modified Hill, Trial 1
Top View
Side View
Amount of Sand Collected

Modified Hill, Trial 2
Top View
Side View
Amount of Sand Collected

Explain (~10 minutes)

Why do you think it was important to conduct your experiment more than once?

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Did you notice any differences when you repeated the same experiments? What were they? What might have caused these changes?

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What new things did you learn about erosion from this experiment? What did you observe that helped you learn this? (What is your evidence for these new ideas?)

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Water isn't the only force of erosion—wind is impactful as well. If you've never explored the topic, look at some photos from the 1954 Dust Bowl: https://life.com/history/dust-bowl-photos-from-an-american-catastrophe/. Write a cause and effect statement based on what you see.

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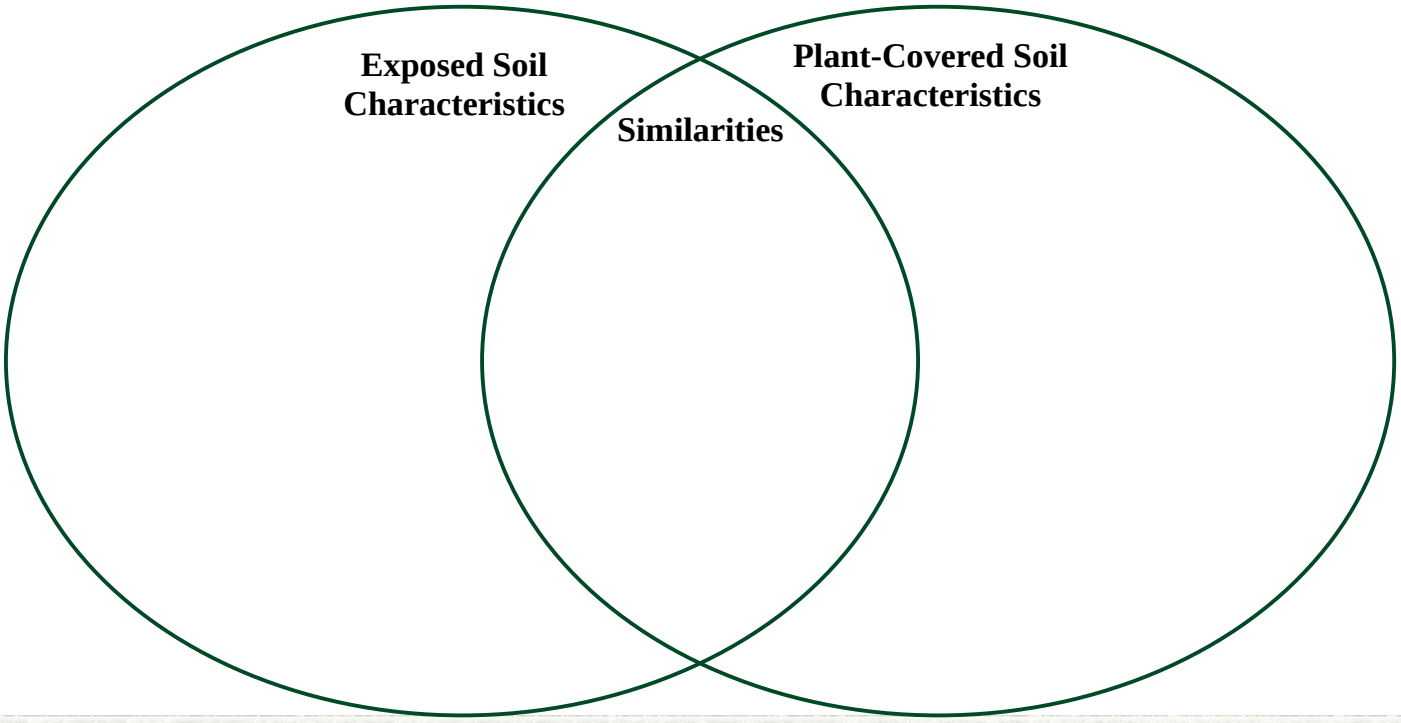
Extend (~35 minutes)

Ask an adult to join you on an outdoor walk. As you're walking, keep an eye out for parts of the ground that are covered with plants and parts of the ground with bare earth exposed. (A planted field, garden, or wooded area might be a great place to find these!)

If it is safe to do so, examine both of these areas more closely. Look at and feel the soil under the plants. Then, do the same for the exposed soil.

What are each of these like, or what traits do they have? How is the soil from each of these areas the same? How is it different?

You can use the Venn Diagram below to help you organize your thoughts and answer these questions.



If you have permission to do so, try pulling up one of the plants. Hold the plant at the base of the stem (near the ground), and pull with a steady motion. What happened? Was it easy or a difficult thing to do?

Did the roots come up with the plant? If so, what do you notice about them? If the roots didn't come up with the plant, why do you think that is?

What effects do you think plant roots have on erosion? What evidence do you have for this?

Why would cover crops reduce soil erosion?

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Reflect (~10 minutes)

What was your favorite part of this lesson? Why?

Do you think erosion is good, bad, or neutral? Why do you think that?

What are some things humans have done that has made erosion worse? What are some things humans have done to reduce erosion?