

5th Grade Science Plan: Erosion at Rocky Face Ridge



Standards:

S5E1: Obtain, evaluate, and communicate information to identify surface features on Earth caused by constructive and/or destructive processes.

- a. Construct an argument supported by scientific evidence to identify surface features (e.g., deltas, sand dunes, mountains, volcanoes) as being caused by constructive and/or destructive processes (e.g., deposition, weathering, erosion, and the impact of organisms).
- b. Develop simple interactive models to collect data that illustrate how changes in surface features are/were caused by constructive and/or destructive processes.
- c. Ask questions to obtain information on how technology is used to limit and/or predict the impact of constructive and destructive processes. *(Examples include seismological studies, flood forecasting using GIS maps, engineering/construction methods and materials, and infrared/satellite imagery.)*

Essential Question:

How can we use scientific evidence and technological tools to understand and protect the surface features of Rocky Face Ridge from the impacts of constructive and destructive processes?

Time:

50 minutes

Background Information:

Erosion is a natural process that involves the breakdown and transportation of soil and rocks. It can occur due to several forces, primarily:

- Water: Rainfall, stream flow, waves, and flooding can erode soil.
- Wind: In arid regions, wind can blow soil particles away.
- Ice: Glaciers can carve out landscapes as they move.

In this lesson, the focus will be on erosion caused by rainfall on the Rocky Face Ridge in Dalton, GA. While erosion is natural, human activities such as agriculture, construction, and mining can accelerate it significantly, with estimates suggesting humans can cause erosion rates to be 10-15 times faster than natural processes. This lesson will explore how vegetation helps to prevent erosion and maintain soil quality.

Materials:

Loaf Pans, Tree Models (Forks and sponges), Soil or Sand, Presentation (https://www.canva.com/design/DAGko6dbnnQ/ubm6_z2nx8WArZXfj5Amsg/view?utm_content=DAGko6dbnnQ&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utm_id=hb2bccef132) , <https://www.rootingfortheridge.com/rocky-face-ridge-map>, Spoons, Bowls, Mini buildings, Filled Water Cups, Water Measurement Cups, Ruler, Data Sheet, Chromebooks (for homework or 2nd day)

Pre-Assessment (5 minutes):

Play "This or That" determining whether the picture in the presentation is constructive or destructive and then discuss each photo.

Show a quick video on Georgia agriculture and why it is so successful (regions and soil content based on constructive/destructive forces).

Have the students give a "thumbs up" for understanding or a "thumbs down" if they do not yet understand something.

- Ask for thumbs-up or thumbs-down: "Do you know what erosion is?"
- Ask for thumbs-up or thumbs-down: "Do you know where the Rocky Face Ridge is?"
- Ask for thumbs-up or thumbs-down: "Do you know what conservation is?"

Introduction (10 minutes):

We see soil, or dirt, every time we step outside so why is conserving it a big deal? Soil erosion, or the washing away of soil by forces like wind and water, is a big problem here and all over the globe when it happens quickly instead of happening over hundreds of years. When it happens naturally over a long period of time, it can create rich nutrient-dense soil like we have in South Georgia. When it happens quickly, it can cause loss of land, pollute waterways by washing pesticides and fertilizers into them, and cause mudslides and landslides. Soil erosion is partially caused by runoff, or water that flows over the surface of the ground after the soil has soaked up as much water as it can. One way to help combat soil erosion is through the use of plants. Plants have root systems that can help "grab" onto soil and keep the soil where it is supposed to be (show examples of well managed slopes). Today, we are going to make our own models of the Rocky Face Ridge to see how the forest impacts erosion on the ridge. The Rocky Face Ridge is located in our county and is important to our environment here because of its dense forests and wildlife.

Launch <https://www.rootingfortheridge.com/rocky-face-ridge-map> on the computer and zoom in somewhere along the Rocky face ridge in Whitfield County. Check OFF City/Town Boundaries. Point out high points and low points (the darker grey areas of the ridge are the steep slopes leading to the top). Tell the students their models are going to show what happens on these high and low points when it rains.

Activity (20 minutes):

1. Group Formation:

Divide the class into groups of five to six. Assign groups to have trees and rocks, have no trees and no buildings, and buildings. Assign each student a specific role:

- Earthquake: Constructs the soil ridge.
- Meteorologist: Measures rainfall
- Storm: Simulates rainfall.
- Scientist: Collects sediment post-rainfall and measures changes in the ridge height
- Architect: Positions trees or buildings in the model (no architect in no trees/buildings group)
- Reporter: Draw or write observation notes about the experiment

As a whole-class group, predict which groups will have the least or most erosion and why.

Materials Distribution:

Provide each group with the following materials:

- 1 pan
- 1 bag of sand
- 1 filled water bulb
- Tree models (for some groups) or mini buildings (for others)

2. Model Construction:

The “Earthquake” will create a ridge in the loaf pan using the soil, ensuring a slope of at least 2 inches high and leaving a 2-inch space at the bottom for sediment collection.

The “Architect” will add at least four trees, rocks, or buildings to their model. The “Scientist” will use the ruler to measure how tall the ridge is before the storm and the “Reporter” mark it on their data sheet.

3. Simulating Rainfall:

The “Meteorologist” will measure out one third of a cup of water. The “Storm” will pour water from the water measuring cup onto the ridge, simulating rainfall. Encourage students to observe how the water interacts with the soil and any structures.

4. Collecting Data:

After the water has been poured, the “Scientist” will collect one scoop of sediment from the pan at the bottom of the ridge and place it in a bowl. The group will observe how much sediment was collected and what happened to the trees or houses. The scientist will also measure the height of the ridge and the “Reporter” will mark it on their data sheet and either write or draw about the experiment.

5. Group Exchange:

After completion, have students switch tables to view the model of another group that had an opposite type of ridge (developed or undeveloped) to observe differences in erosion and sediment collection.

6. Cleanup:

Students will clean their work areas and return to their seats.

Wrap-up (5 minutes):

Discuss that scientists learn by observing.

Have the students share what they observed about how soil is moved by water. Prompt the students with the following questions;

- What do your observations tell us about the way water changes land? Mention that this can improve the soil quality like it did for South Georgia if it happens slowly over time, but can cause massive devastation if it is done quickly like with Hurricane Helene.
- What landmarks can we look for to assess whether an area is at risk for flooding or landslides because of erosion? (lakes, ponds, rivers [because these are areas where water naturally collects], nearby slopes with no trees)
- Using what we observed in our model, what can we infer would happen on Rocky Face Ridge if the trees were removed and buildings and roads put there instead?

Evaluation (5 minutes):

At the end of the lesson, distribute an exit ticket. Each student should write:

- One sentence explaining how new landforms are created by erosion.

Post Assessment (Homework or 2nd Day Activity) :

Students will go to <https://www.rootingfortheridge.com/rocky-face-ridge-map> and follow the below steps;

1. On the Map layers section on the right, make sure the bottom option “Environmental Factors” is checked, click the arrow next to it to drop down another menu and click the box next to USA Flood Hazard Areas
2. Type Your Address into the Search Bar on the top left and Click the Magnifying Glass. Look on the map and see if your home is
3. In a Google document, or on paper write down
 - 1) Your address
 - 2) If your address is in a Flood Hazard Zone (it is in one of the purple or blue sections) or not (not in a purple or blue section)
 - 3) Write one sentence about how removing trees on a steep slope like the Rocky Face Ridge impacts flooding.

Differentiation:

Guided Questions During Observation:

- Assign students that may struggle kinesthetically to the role of *Recorder* and have them draw or write observation notes about the experiment. Advanced students can be instructed to write a hypothesis of what will occur for their model before it is created.

- Provide sentence starters for students who may struggle with open-ended questions during the wrap-up discussion. For example:
 - “I observed that water caused the soil to...”
 - “This tells us that water can change the land by...”
- Pair students with differing abilities so they can support one another during group activities. For instance, a stronger student can assist a peer with data collection and observations, fostering collaboration and peer teaching.

Extension:

- View this short video of erosion at work so that students may see a real-life example. Timelapse video of erosion: <https://www.youtube.com/watch?v=N8C9OaBRW2g>
- Have students research specific case studies of areas affected by erosion (barrier islands in Georgia, Mississippi River Delta, Great Smoky Mountains Erosion, Welcome Spring in Utah, etc.). They can create a presentation or report detailing the causes, impacts, and mitigation strategies used.

Lesson developed by:

The Dalton Resilient Community Group with Keep Dalton-Whitfield Beautiful, Whitfield County 4-H, Sarah Ott, and the Dalton-Whitfield Solid Waste Authority.

