Lesson 4.3
Modeling Erosion: Time
In this lesson, students use a stream table to investigate the question *What affects the amount of rock that water can erode?* Students first narrow their focus to investigating one of the factors that affects erosion—the amount of time water flows over rock. The teacher shows students two stream tables, which will be used together as the Erosion Model. Students determine how to use the Erosion Model to test how the amount of time a river flows affects erosion. The teacher prepares the model and students observe and record what happens. Students also return to *Rocky Wonders* to read about how water can cause erosion as well as be a natural hazard. The purpose of this lesson is for students to observe that the amount of time water flows over rock is one factor in how much erosion occurs.

**Anchor Phenomenon:** There are more rock layers exposed in Desert Rocks Canyon than in Keller’s Canyon.

**Predicted Phenomenon:** Erosion from a river that flows for a long time compared with a shorter time

**Students learn:**

- A river that has flowed over rock for a longer period of time will erode more rock than a river that has flowed over rock for less time.
- A variety of hazards result from natural processes involving water, such as flash floods and large waves.
Conducting the Erosion Model

The class runs the Erosion Model. While the rivers are running, students return to Rocky Wonders to read about water as a natural hazard.

Instructional Guide

1. **Introduce notebook page 75**. Have students turn to page 75, Natural Hazards, in their notebooks and explain that the Erosion Model will take some time to complete, so while it is running, they will read more about natural hazards caused by water in Rocky Wonders, and reflect on this idea.

2. **Assign student pairs and distribute Rocky Wonders.**

3. **Gather students around the Erosion Model.** Have students encircle the area where you will be running the model and ensure that all students can see.

4. **Discuss predictions.** Remind students how they agreed to set up the model. Ask students what they think will happen once the “rivers” start flowing.

   What do you think will happen? What differences do you think we will see in the two rivers? Why do you think so?

   Encourage students to think about the Sim investigation from the previous lesson to help them make predictions about the Erosion Model.

5. **Begin the model.**

   - Place one hand into each bucket of water. While the tubing is still submerged, place a finger over one end of the tubing in each bucket.
   - With your finger still covering the ends pull that end of the tubing out of the water. It is important that the tube is filled with water and its end is hanging below the bucket or the water will not flow. It is also important that the other end stay submerged in water or the water will stop flowing.
   - Arrange the tubing over each stream table near the top and let go of the end.

6. **Solicit initial observations from students.**
If students do not notice, direct them to observe the amount of sand displaced in each stream table and the amount of sand accumulating in the water bucket below each stream table.

Have students observe the model for one to two minutes.

7. **Stop the model.** If you started the stream tables at different times, stop them both at once after they show noticeably different amounts of erosion. If you started the stream tables at the same time, stop the flow of water in one stream table after about a minute and let the other stream table run until its water bucket is depleted.

8. **Have students return to seats to complete the notebook page 75, Natural Hazards.** You may wish to stagger when you dismiss students so all students have a chance to observe the Erosion Model closely. As pairs work on the notebook page, circulate and encourage them to discuss natural hazards.

9. **Invite small groups of students to observe the completed Erosion Model.** When the water in the second stream table has stopped, invite students up to the Erosion Model to make observations. Encourage them to make close observations of the model.

10. **Point out evidence of more or less erosion.** Look for areas with deep, steep sides to show more erosion and areas with shallow edges to show less erosion.

11. **Have students turn to notebook page 76, Observing the Erosion Model, Part 1.** Review the instructions. Have students record their observations by drawing the two rivers. Make sure students also answer the question at the bottom of the page.

**Teacher Support**

**Instructional Suggestion**

**Classroom Management: Erosion Model Teacher Demonstration**

The Erosion Model investigation is a teacher demonstration. Students will need to gather around the stream tables to observe them. Before this demonstration, you may choose to review classroom rules and procedures to avoid any behavioral concerns during the demonstration. Let students know that they will be sharing the space around the Erosion Model and that they should adjust where they are standing to accommodate others. You could also take a picture of the model and project it on the board to aid students in making their diagrams.

**Instructional Suggestion**

**Classroom Management: Early Finishers**

If you find that some students need more time to complete the Natural Hazards notebook page, but others are finished fairly quickly, you can have students come up to use the extra time to observe the Erosion Model. Encourage these
students to think about the evidence they are seeing in the Erosion Model that supports the idea that the rock (represented by the sand) is eroding. Alternatively, you could encourage early finishers to read about additional natural hazards in *Rocky Wonders*.

**Instructional Suggestion**

**Going Further: Mathematical Thinking**

After the Erosion Model is completed, consider measuring how much sediment flowed out of the model in one minute. For ease, round off the measurement to the nearest ½ cup. If the flow of sediment were constant, how much sediment would flow out of the stream in two minutes? Four minutes? Twenty minutes?

After students have calculated, discuss the pattern. Can they generate a rule that would allow them to calculate for any time frame without having to actually measure and collect the sediment? Continue this discussion by asking students to consider the implications for a delta or lake that is downstream. What if there were a year’s worth of sediment? One hundred years? The purpose of this activity is to provide students with an opportunity to explore basic algebraic thinking and practice computing skills in a real-world context.

**Possible Responses**

Answers will vary.
Natural Hazards

1. Reread the “Hazard Warning!” sections in Rocky Wonders.
2. Answer Questions 1 and 2.
3. Think about the Erosion Model and answer Question 3.

Question 1: What are some natural hazards caused by water?

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Question 2: Choose one hazard caused by water that you read about. How does it happen?

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Question 3: What natural hazards do you think could happen near a river? What could people near a river do to stay safe?

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Peligros naturales

1. Vuelve a leer las secciones “¡Advertencia de peligro!” en Maravillas rocosas.
2. Responde las preguntas 1 y 2.
3. Piensa en el modelo de erosión y responde la pregunta 3.

Pregunta 1: ¿Cuáles son algunos peligros naturales causados por el agua?

Pregunta 2: Elige un peligro causado por el agua sobre el cual leíste. ¿Cómo sucede?

Pregunta 3: ¿Qué peligros naturales crees que podrían suceder cerca de un río? ¿Qué podría hacer la gente cerca de un río para mantenerse segura?