

Watershed Experience Lesson 2:

Fluvial Geomorphology

ACTIVITY TYPE: *Stream Table Demonstration*

AUDIENCE: *High School*

TIME FRAME: *1 hour 15 minutes*

SUMMARY:

We use stream tables to demonstrate the principles of stream hydrology to help students understand how rivers shape the land. This includes the vocabulary associated with sediment movement.

MATERIALS:

- Two Stream tables (see resources on where to purchase or how to make your own)
- Sediment containers with sand, silt, and clay
- Laminated cards on popsicle sticks
- Expo markers
- Stopwatches
- Bricks/blocks to tilt a stream table
- Lab sheets & clipboards

PREPARE AHEAD:

This lesson is formatted for a 3-rotation style lesson with 3 educators. It can be modified for group size and timing based on the number of educators.

ENGAGE:

*Start by asking if they remember our guiding question. Remind them we are looking at **How does human activity affect the quality of water in our watershed?** Before we can talk about land use, let's look at how streams and rivers flow. Ask them: Do streams ever change? If so, how? If not, why? Have them discuss this question amongst themselves before bringing the class back together to discuss. Then, on the board, write "Fluvial Geomorphology" and introduce it as the study of how streams change.*

- *Fluvial: rivers, flowing water*
- *Geo: earth, minerals*
- *Morphology: shape and function of things*

Introduce students to the stream table, the tool we will use to study this phenomenon. Review what a model is, and why it is useful for scientists: a model can demonstrate the behavior of a real thing, just on a smaller scale or shorter timeframe.

PROCEDURE:

Divide students into three groups and prepare to have them move through three rotations. Hand out their lab sheets and encourage them to take their own notes, because for the 3rd stream table lesson, they'll be tasked with a group challenge on streams.

Rotation 1: Stream Lingo & Principles

This rotation needs one stream table, laminated signs for adding terminology, and expo markers.

1. Set the sand up to be flat on the stream table. Ask students what they think will happen when you turn the water on. Where will the water go? What will it look like in 5 minutes?
2. Then run the water, and label things as they occur (list of terminology in below "Background" section). Things may happen quickly, so after a few minutes, stop the flow

and review what happened so far. As certain formations form, write them on a sign and stick it into the sand.

3. When the stream is flowing, continually point out or ask the students where **erosion** is happening, and where **deposition** is happening. This will be important going into lesson 2.
4. Have students note on their lab sheets any phenomenon or formation that they think might be important for a community that lives near the river to be aware of.

Rotation 2: Variables in Stream Behavior

For this rotation, you need a set up stream table along with some bricks/blocks to incline

1. Discuss that not all streams are the same. Ask what things are different from stream to stream. How might these things shape how the stream looks or acts as it flows?
2. Variables they might bring up: soil type, amount of rain, how bendy it is, how rocky it is, how fast the river is flowing, the type of vegetation or nearby land use.
3. Test some variables using the stream table, and have students record the results. As they watch, point out where erosion is happening and where deposition is happening.
 - a. Gradient: Run the stream on a flat surface, and then again with blocks under one side to create an incline
 - b. Flow rate: run the stream table with a low volume flow, then turn it up.
 - c. Sinuosity or Depth: make a pre-hollowed stream before running the stream, and you can vary the channel depth or curve sinuosity

Ask what might cause any of these variables to change.

Rotation 3: Impacts of Sediment

For this rotation, you need three clear jars of water, one each with sand, silt, and clay.

1. Ask students to share the materials that make up different kinds of stream bottoms. What makes them different? Introduce the word sediment.

2. Explain that different types of soil have different sized particles of sediment. Water is always moving sediment in streams, and different speeds of water will move different sizes of sediment in different ways, affecting the erosion and deposition patterns in a streambed.
3. Set the bottles of water and sediment on a table. Each bottle simulates a stream with a different kind of bottom material. To simulate slow moving water, ask three students to gently flip one bottle for 10 seconds. Observe the sediment that is picked up and time how long it takes for the sediment in the bottle to settle.
4. To simulate fast-moving water, have three students vigorously shake the bottles for 10 seconds. See what's different and ask what that might mean in a real streambed.
5. After the simulations, ask students to make observations about the water and sediment and note down what was important. You can ask continuing questions:
 - a. Which materials would stay suspended in the water longest?
 - b. What conclusions can we draw about how speed affects what water is able to pick up, and how could that change deposition?
 - c. What natural events might make water flow more quickly or more slowly in a stream? Would those last a long or short time?

BACKGROUND:

Fluvial Geomorphology is a science that is studied by biologists, ecologists, architects, and city planners alike. It brings together how water changes the landscape around it and how humans interact with the rivers around them.

Key Terms to Know (for Rotation 1):

- Meander: the bend of a stream
- Delta: sediment deposit where the mouth meets the ocean
- Cut Bank: a concave or steep bank created by erosion
- Point Bar: a ridge in the middle of the stream created by deposition
- Channel: the area containing the flowing water
- Bank: the area alongside the flowing stream water
- Riffle: shallow, fast moving, rocky area
- Pool: deep, slow-moving area

RESOURCES:

Make Your own Stream Table video: https://www.youtube.com/watch?v=dg_l4A9KLig



Purchase a Stream Table: <https://store.sciencefirst.com/stream-table-deluxe-oversize> OR

<https://www.avantorsciences.com/us/en/product/9433793/clearview-classroom-stream-table>