STREAM TABLES

Introduction:

Most of us have seen streams or rivers. When we're walking or driving, we cross them by using bridges. There are times when it seems we have to cross a stream several times to get where we want to go. The paths rivers and streams follows can vary, and their paths are dependent on a number of factors. Also, people have historically used rivers for a variety of purposes, including travel, drinking water supplies, and removal of waste materials. In this activity, you will explore how streams make their paths and identify some of the factors that determine what that path looks like. You will also explore how water flow in streams affects the dispersal of pollutants.

Objectives: Upon completion of this activity, the student should be able to . . .

1. Identify at least two types of stream paths
2. Name at least three factors that affect the path a stream takes
3. Describe the effects of each of the three factors in objective #2 on the type of path a stream makes
4. Describe the path ground pollutants take when near and in a stream or river

IL State Standards: The IL State Standards addressed by this activity are . . .

12.E.3a – Analyze and explain large-scale dynamic forces, events and processes that affect the earth's land, water, and atmospheric systems.
13.B.3d – Analyze the interaction of resource acquisition, technological development and ecosystem impact

Materials:

1 Wallpaper tray or square dish pan
2 Wood blocks same size
3 One-gallon buckets
1 Tube, narrow and flexible, 60 cm long
1 Acetate or plastic dam
1 Box food coloring
1 Gallon of fine sand
1 Long wood block for smoothing sand
1 Plastic cup for dipping
1 Paraffin or plastic block
6 Cotton swabs
Paper towels and water

Procedures:

First Run

A. Put the sand in the wallpaper tray. Pile most of the sand toward one end of the tray, and smooth the top of the sand so it makes a wedge (see Figure 1). You will need to soak the sand so that it is wet but not so much that excess water runs out at the "shallow end."

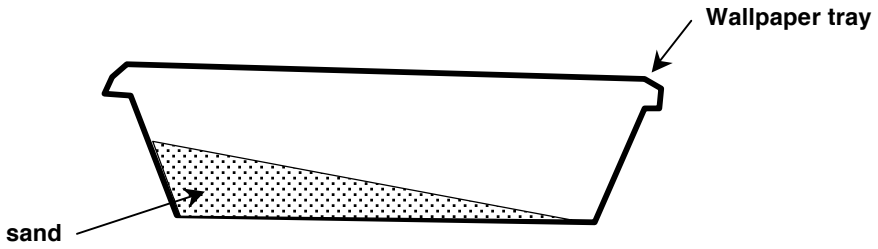


Figure 1

B. Fill one of the one-gallon buckets with water – to about 3/4 full. Turn another bucket upside down and place it next to the end of the wallpaper tray that has the thickest layer of sand. Then, set the water-filled bucket on top of the upside down bucket.

C. Take the flexible tube and dip one end of it into the bucket of water. Slowly lower the tubing into the water, being sure the end does not come up out of the water. Eventually, you should end up with the entire tube filled with water – and underwater in the bucket.

D. You are now going to siphon water out of the water bucket and onto the sand. To do this, pinch the top end of the tubing tightly so no water can escape from it. Pull some of the tubing out of the bucket and move its end to rest just over the end of the wallpaper tray. When you release the pinching on the tubing, water should flow from it and into the tray. If this does not happen, try to siphon again.

E. As the water runs from the tube onto the sand, you should observe that it makes a stream in the sand. Carefully observe the path the stream makes. Allow the water to run for about five minutes (or as long as the water bucket contains water). Be sure to write down your observations in the Data Sheet (on last page) under "First Run." Also, as the water runs down the sand, it will collect at the other end of the tray. You may need to use the plastic cup to dip this water out and dump it into the third gallon bucket – so the tray does not overflow onto the table or floor. (See Figure 2.)

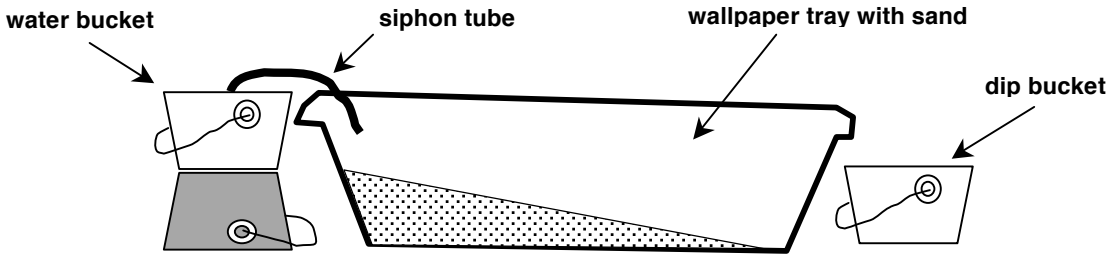


Figure 2

Second Run

F. For the "Second Run," you will repeat Procedures A-E, but this time you will do it with wood blocks placed beneath one end of the tray. This will make the slope of the sand more steep. You may need to smooth the sand with an extra wood block. Again, record your observations in the Data Sheet under "Second Run." (See Figure 3).

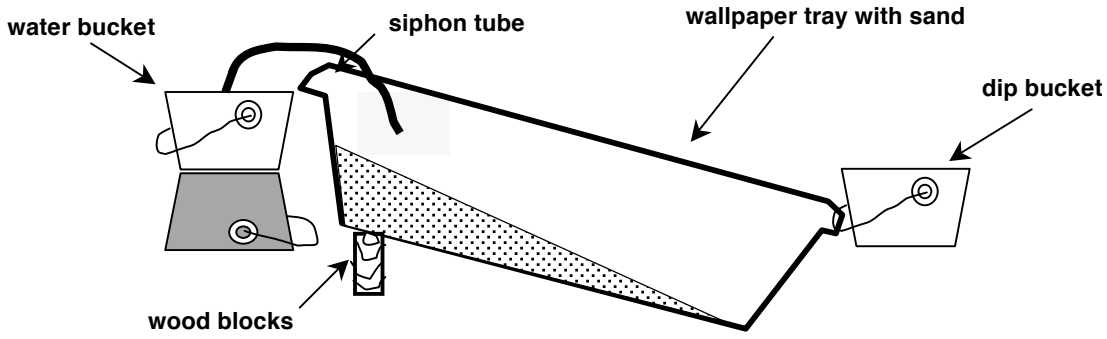


Figure 3

Third Run

G. For the "Third Run," re-set the tray as it was for the "First Run." During this "Third Run," you will be using a plastic dam (see Figure 4 on next page). Smooth the sand with the extra wood block. Insert the plastic dam into the sand about one-third of the way down from the "upper end" of the tray. The dam should be inserted perpendicular to the tabletop (like a vertical wall in the sand). Allow about half of the dam to be up out of the sand. Then let the water flow, and again make your observations and record them in the Data Sheet under "Third Run."

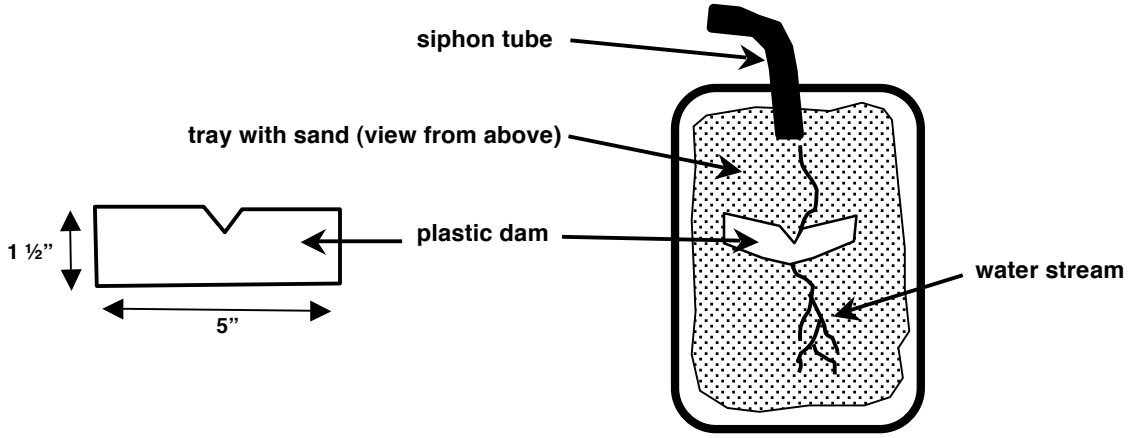


Figure 4

Fourth Run

H. For the "Fourth Run," re-set the tray again as it was for the "First Run." During this run, you will use a paraffin block to represent a rock layer that is resistant to erosion. Smooth the sand with the extra wood block, and about half way down the stream's path, carefully insert the paraffin into the sand. The paraffin should be "slid" into the sand horizontally so it is like a "stair step" buried in the sand. Then, use your finger to make a shallow trough from where the siphon tube will touch the sand down to where the paraffin block is located. Let the water flow, and again make your observations and record them the Data Sheet under "Fourth Run" (see Figure 5).

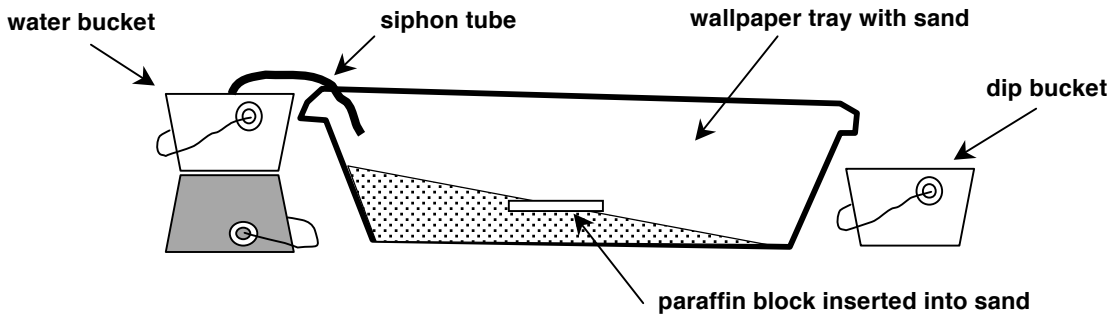


Figure 5

Fifth Run (Pollution Test)

I. For this run, re-set the tray as it was for the "First Run." Be sure to smooth out the sand. Then, make a shallow trough with your finger to help the stream path form.

J. Get four cotton swabs. Place a drop of food coloring on one tip of each of swab (you may use different colors if you like). The food coloring represents pollutants, and the swabs represent wells or deposits (like landfills) where pollutants collect.

K. Insert the colored ends of the cotton swabs into the sand. The swabs should be "stuck" into the sand so they stand up like posts. Place them at differing distances from the stream path. For example, the one closest to the "top end" of the tray can be placed near the side of the tray, the second one down the tray can be placed about 6 cm from the stream, the next one 3 cm from the stream, and the last one (nearest the "bottom end" (see Figure 6 on the next page).

L. Begin the water flow, and observe what happens to the colors from the cotton swabs. Record your observations in the Data Sheet.

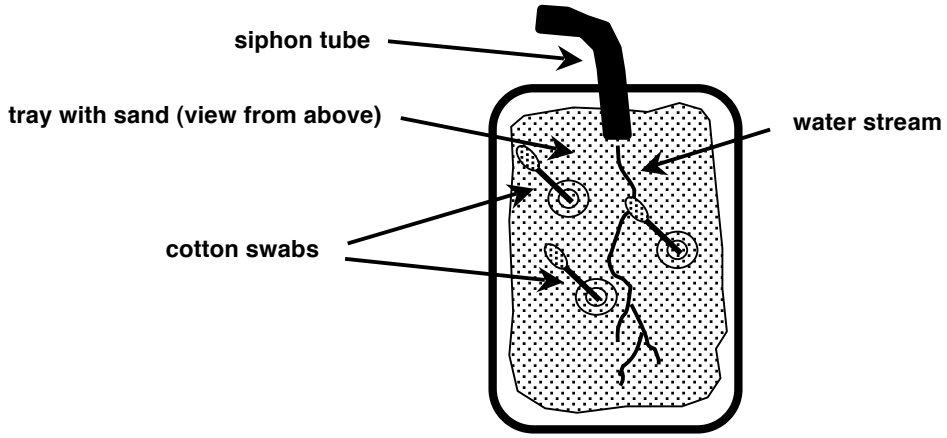


Figure 6

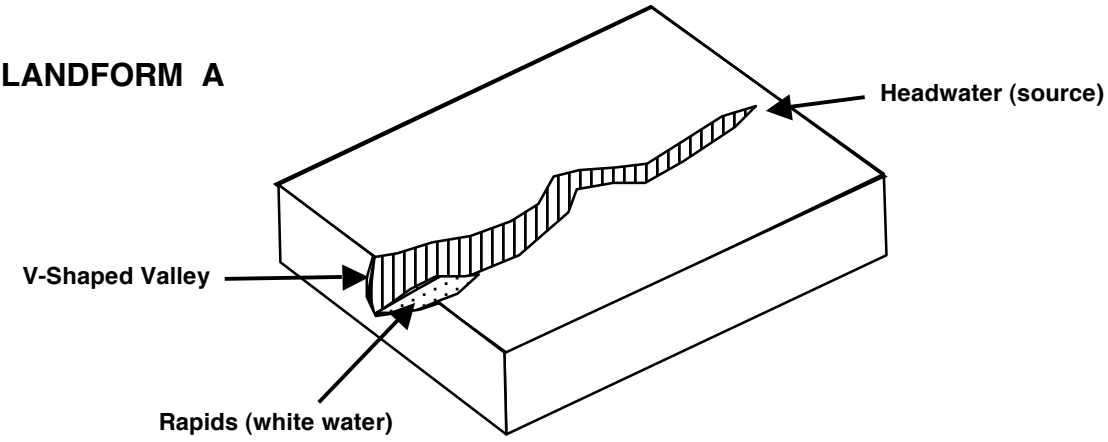
Questions:

1. How does increasing the slope, or steepness, or a stream affect the path it makes?
2. Sometimes, the amount of water moving in a stream has an effect similar to that of increasing the slope of a stream. If you could double the amount of water flowing through the tray in the First Run, what do you think the stream path would look like? Explain why you think so.
3. In the Third Run, you examined the effects of damming a stream.
   a. What happened to the water just behind the dam?
   b. What happened to the sand at the sides or edges of the dam?
   c. What happened to the sand in front of the dam at its base (where it met the sand)?
   d. Based on your answers to 3a, 3b, and 3c, what might cause a real life dam to fail?
4. In the Fourth Run, you examined the effects of a stream moving across a rock layer that is resistant to erosion.
   a. Where was erosion of the sand most pronounced around the resistant layer?
   b. If this occurred with a real stream, what would we call the physical feature that was formed by the stream at the resistant layer?
5. You examined the movement of ground pollutants in the Fifth Run.
   a. What happens to a concentration of pollutants when ground water makes contact with them?
   b. In what direction to ground pollutants move when a stream is nearby?
   c. Consider your answers for 5a and 5b above. If you were to construct a landfill to hold toxic materials, what would be one important factor to consider for its location?
6. Look at the page of “Geologic Landforms” on the next page.
   a. For streams flowing like the one in the First Run, which geologic feature is most likely the one formed? Explain why you think so.
   b. For streams flowing like the one in the Second Run, which geologic feature is most likely the one formed? Explain why you think so.
   c. Which Run (First, Second, Third, Fourth, or Fifth) would be most likely to produce Geologic Landform B? Explain why you think so.

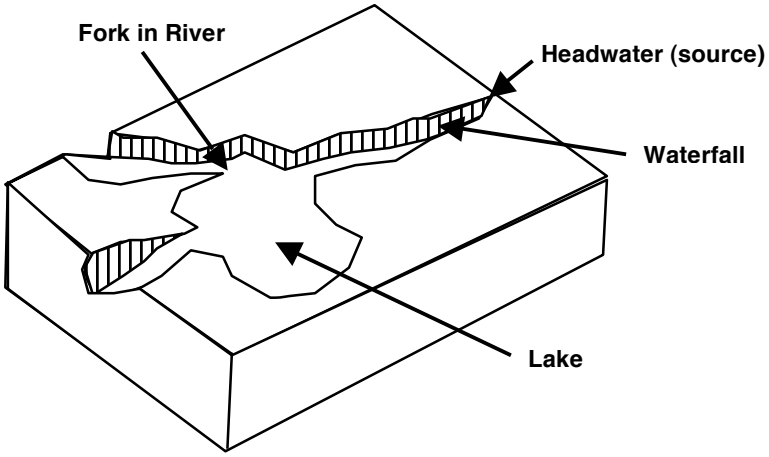
Resource: Great Exploration in Math and Science. (1989). *River cutters*. Berkeley, CA: Lawrence Hall of Science, California State Board of Regents.

GEOLOGIC LANDFORMS

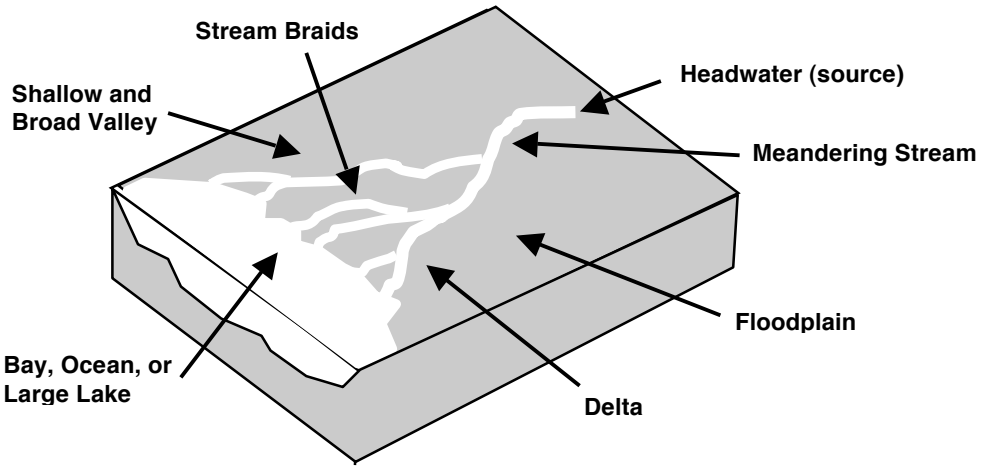
LANDFORM A



LANDFORM B



LANDFORM C



Name: _____

DATA SHEET

Run #1: "Flat tray"

Observations

Draw the stream path:

Run #2: "Steep tray"

Observations:

Draw the stream path:

Run #3: "With dam"

Observations:

Draw the stream path:

Run #4: "With resistant layer"

Observations:

Draw the stream path:

Run #5: "With ground pollutants"

Observations:

Draw the stream path: