TEACHERS GUIDE

AMSCI STREAM TABLE KIT
ITEM #6600-00

The AmSci Stream Table Kit gives students the opportunity to observe geologic principles and processes in action. Many geologic processes take place on a scale that is larger and over a longer time than can easily be seen in the classroom. This kit invites students to explore stream velocity, stream load, and stream channels and to make connections between the classroom model and real-world waterways.

Materials

- Pail
- Protractor
- Cork or Paper
- Sand
- Stopwatch

Goals & Objectives

See page 12 for Next Generation Science Standards (NGSS)

INTRODUCTION

By completing the activities in this guide, students will:

- Observe and discuss a 3-dimensional, functional stream model
- Make connections between the model and real-world geological processes regarding stream velocity, stream load, and stream channel changes
- Assess the strengths and weaknesses of the model
- Draw conclusions about real world geologic processes

KIT SET-UP

Use the following steps to assemble and prepare the AmSci Stream Table Kit for use prior to the lesson.

1. Cut the 6’ plastic hose in half to create an inlet hose and an outlet hose.

2. Attach the outlet pipe assembly to the stream table as shown in Figure 1:
    a. Place a rubber washer on either side of the hole in the Stream Table and insert the threaded pipe through the hole and washers.
    b. Tighten the round nuts on both sides of the Stream Table.
    c. Push on of the pieces of plastic hose over the brass pipe of the outlet pipe assembly.

KIT SET-UP

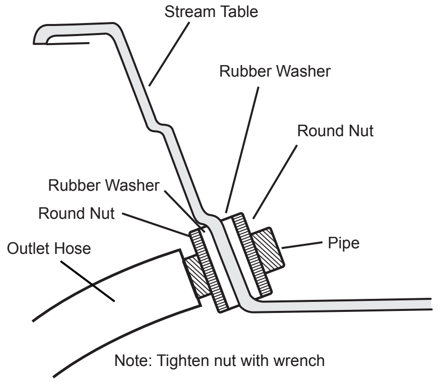

Figure 1

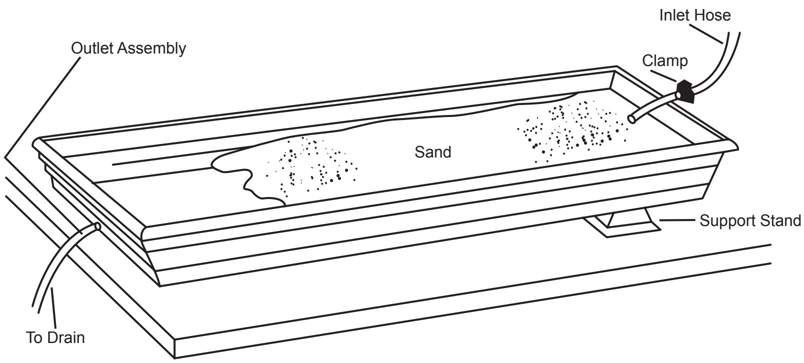

Figure 2

d. Direct the outlet hose into a sink, drain, or pail. See Figure 2.

3. Prepare the inlet hose:
   a. Attach the second plastic hose to a water faucet, recirculation pump or siphon system.
   b. Direct the other end of the hose through the adjustable clamp and into the stream table opposite the outlet hose.
   c. Adjust the flow of water using the adjustable clamp.

4. Place the plastic supports under the inlet hose end of the Stream Table so that it is raised higher than the outlet end. See Figure 2.

ACTIVITIES

Activities continued

1 Explore variables that affect stream velocity

<u>Purpose:</u> Students will determine how slope and the rate of discharge effect the velocity of a stream.

<u>Activity Set-up:</u>

A. Prepare the Stream Table according to the Kit Set-up.

B. Place the trough on the floor of the Stream Table with the open end down toward the outlet hose. See Figure 3.

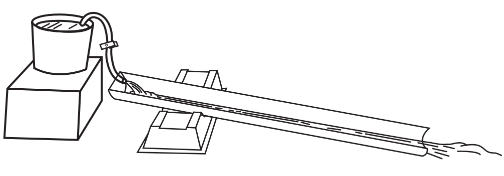

Figure 3

<u>Activation of Prior Knowledge:</u>
Ask students to think about rivers or streams that they have seen or are familiar with. They should try to recall fast-moving streams and slow-moving ones, as well. Have them briefly discuss the following question with a partner:

What affects the speed/velocity of the water in a stream or river?

A. Procedure:

Test the effect of slope on stream velocity

i. Adjust water to flow into the trough from the inlet hose in a slow, steady flow.

ii. Break up small bits of paper or cork and drop them one at a time into the uppermost part of the trough.

iii. Use a stopwatch to measure the time it takes for the cork or paper to travel from one end of the trough to the other (90 cm).

iv. Repeat this procedure at least 3 times and determine an average "descent time".

v. Convert the descent time into a velocity rate by figuring the distance traveled over a unit of

***Note**
It is always wise to DO an experiment ahead of time to be able to best present it to the class.

!

ACTIVITIES

Activities continued

time (for example: 30 cm/ second).

vi. Raise the input end of the trough to a low angle of 3-5 degrees and repeat the procedure. Use a protractor to measure the angle.

vii. Repeat the procedure at various heights (10 degrees, 20 degrees)

viii. Graph the results.

A. Test the effects of water discharge on stream velocity.

i. Adjust the trough to an angle of approximately 15 degrees.

ii. Adjust the water flow to very low.

iii. Using the cork or paper method described in Part B, calculate the average “descent time” and the corresponding velocity reading.

iv. Adjust the water to an intermediate flow and repeat the measurements.

v. Adjust the water to maximum flow and repeat the measurements.

vi. Formulate a conclusion regarding how the volume of flow (discharge) affects the velocity of the flow.

vii. Challenge: Determine a way to measure the volume of flow in cubic cm per second and graph the change in velocity due to discharge.

Discussion Questions/Prompts:

- What is the relationship between the slope of the stream channel and the velocity of the stream?
- What is the relationship between the discharge of a stream and its velocity?
- How well does the model represent a real-world stream or river?
- Which of the following streams will have the greatest velocity?
    - *high discharge, gentle slope*
    - *high discharge, steep slope*
    - *low discharge, gentle slope*
    - *low discharge, steep slope?*
- What are other factors that

Activities continued

can affect the velocity of a stream? How could you test these factors

2 Determine the load of a stream

<u>Purpose:</u> Students determine how much earth material moves past a fixed cross-section of a stream channel in one unit of time (load).

<u>Activity Set-up:</u>

A. Prepare the Stream Table according to the Kit Set-up.

B. Set the trough propped up at a low angle (5 degrees) on the floor of the Stream Table with the open end down toward the outlet hose. See Figure 4.

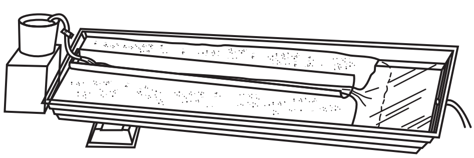

Figure 4

<u>Activation of Prior Knowledge:</u>
Ask students to think about rivers or streams that they have seen or are familiar with. They should try to recall fast-moving streams and slow-moving ones, as well. Have them briefly discuss the following question with a partner:

How does the velocity of the water affect the amount of earth it can move?

Procedure:

A. Measure 100 cubic cm of sand and spread it evenly along the entire length of the trough.

B. Adjust the water to a medium flow and measure the amount of time it takes for the water to wash the trough clean of sand.

C. Convert the measurement into cubic cm of sand per second by dividing the number of seconds into 100 cubic cm.

D. Repeat the procedure with the trough adjusted to a slope of 10 degrees.

E. Repeat the procedure with the trough adjusted to a slope of 20 degrees.

F. Use the velocity readings from Activity I to graph the relationship between velocity and load.

Discussion Questions/Prompts:

ACTIVITIES

Activities continued

- Assuming there is an endless supply of loose earth material, what is the relationship between the velocity of a stream and its load?
- Why do mountain streams with steep slopes and high velocity have a much smaller load than lowland streams with gentle slopes and low velocity.
- From your observations of the sand, how does the velocity affect the size of the particles that can be moved? If you repeated this investigation with a mixture of pebbles and sand, what results would you expect?
- During what time of year would you expect most stream erosion to occur?

3 Explore changes in a stream channel:

Purpose: Students explore how a stream channel changes over time.

Activity Set-up:

A. Prepare the Stream Table according to the Kit Set-up.

B. Fill the two-thirds of the Stream Table opposite the drain with sand.

C. Elevate the input end as high as possible by sliding the support under the Stream Table toward the center of the tray.

Activation of Prior Knowledge: Ask students to think about rivers or streams that they have seen or are familiar with. They should try to recall fast-moving streams and slow-moving ones, as well. Have them briefly discuss the following question with a partner:

- Do rivers and streams always follow the same path? Why or why not?

Procedure:

A. Carve a narrow trench through the entire length of sand.

B. Place the water tube at the upper end of the trench.

C. Measure the width of the trench at its head, center, and mouth.

D. Direct the flow of water (medium flow) down the trench for 2 minutes. Then remove the water.

ACTIVITIES

Activities continued

- **E.** Remeasure the trench width at all three locations.
- **F.** Reduce the elevation of the stream table by removing the support completely.
- **G.** Allow the water to flow down the trench for 15 minutes.
- **H.** Observe the stream channel changes.
- **I.** Turn off the water and remeasure the channel.

Discussion Questions/Prompts:

- How did the path of the stream change?
- Why does this phenomenon occur?
- Where did the channel's width change most rapidly?
- What land form develops at the mouth of this stream? Why?
- What elements are missing from the model that might affect the ways in which a stream channel might change paths?
- How might geologic and human-made structures affect the changing path of the stream? Consider specific examples. How could you test your predictions using the Stream Table?

GLOSSARY

Vocabulary:

- Cross-section
- Delta
- Discharge
- Erosion
- Load
- Slope
- Stream channel
- Velocity

NOTES

NOTES

NOTES

Next Generation Science Standards

Students who demonstrate understanding can:

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

HS-ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Standards Key

K = Kindergarten
3 = 3rd Grade
(numbered by grade)
MS = Middle School
HS = High School
PS = Physical Science
LS = Life Science
ES = Earth Science

!