BRIDGES

Lesson Plan: **Water Filter Activity**

Cadence the Caddisfly and Stream Flow

Alignment with STEM Framework

Conservationist **Investigator**

Overview

Youth will analyze the impact of stream flow and turbidity of local water sources on macroinvertebrates, specifically caddisfly and its larvae.

Practice Goals

- [ ] Asking questions and defining problems
- [ ] Planning and Carrying out InvestigationsEngaging in argument from evidence Analyzing and Interpreting Data
- [ ] Using Mathematics and Computational Thinking
- [ ] Engaging in Argument from Evidence
- [ ] Obtaining, Evaluating, and Communicating Information

Content Goals

- [ ] What does turbidity indicate about stream flow contents?
- [ ] What impact does stream flow and its contents have on macroinvertebrates?
- [ ] What has happened to the caddisfly and its larvae in this stream?
- [ ] How do I calculate stream flow?
- [ ] How do stream flow rate and sediment carry relate to one another?

Purpose

The purpose of this activity is to get youth to understand the relationship between streamflow, water quality and the impact on wildlife. This lesson focuses on caddisfly populations. Investigating this relationship youth have the opportunity to ask questions and seek solutions about water quality and its impact on the inhabitants of the watershed.

Teacher Background Information

Turbidity

Rate of Flow and Water dynamics

Caddisflies

Caddisflies 2

Affinity Goals

I can act like an **Investigator** by studying the ways that runoff can get into watersheds within the EnviroScape and find ways to maximize the effectiveness of best practice methods.

I can act like a **Conservationist** by studying the ways that runoff can get into watersheds within the EnviroScape and find ways to maximize the effectiveness of best practice methods.

Materials

- [ ] Caddisfly Puzzle Pieces
- [ ] 4 Stakes
- [ ] Enough string to cross stream or creek twice
- [ ] 10 Flags
- [ ] Ping Pong balls
- [ ] Calculators
- [ ] Stopwatch
- [ ] White Boards and Markers
- [ ] 50’ Measuring Tape
- [ ] 10’ Measuring Tape
- [ ] Meter Sticks
- [ ] Flowing Stream
- [ ] Streamflow Handout
- [ ] Water Resistant Boots

Time Needed

55 Minutes

Since caddisfly larvae will make their case out of almost any material, some people take the larvae out of their habitat and put them in a new habitat with precious materials. These new kinds of cases are used to make art and jewelry.

Caddisfly larvae make a case using silk from their mouth that is like a waterproof glue. Caddisfly larvae will glue together almost any material close by, sometimes sticks and stones.

Caddisfly larvae have diverse diets and feeding strategies. They are filter feeders and mainly herbivores, eating tiny pieces of plant material.

This is Cadence the Caddisfly Larva. She lives in the lake at Haw River State Park. Cadence used to have a lot of family and friends, but now many of them are gone. What could have caused that?

Caddisflies are one of the largest groups of aquatic insects with about 7,100 described species worldwide.

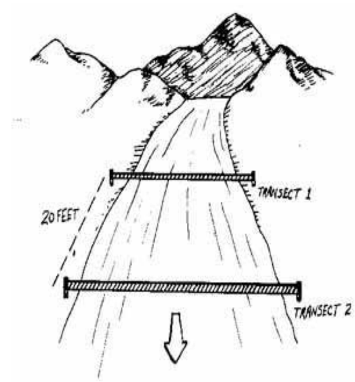
There are approximately 1,340 species in North America.

Caddisfly larvae can live in almost any aquatic habitat, but they are fragile and sensitive to changes in water quality and composition.

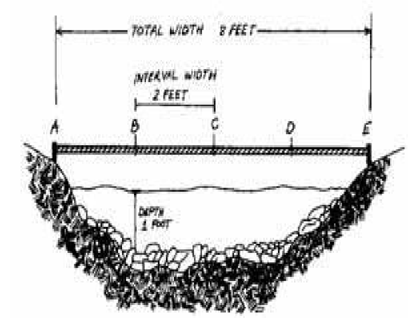
Welcome to Stream Flow!

How would you describe this stream's flow?

Let's find out! Follow these directions and have fun!



1. We've already found a section of the stream to study and it should already have two pieces of string going across the stream. These are called **transects**.
2. Split up into two teams. One team will go upstream to **transect #1**. The other team will go downstream to **transect #2**
3. Measure the exact distance between the transect #1 and #2 and record it on the whiteboard.
4. At each transect you'll need to measure the cross-sectional area.
    a. Use a meter stick to measure the depth (in cm) at each flag on your group's transect and record the depths on the big whiteboard.
    b. Find the average depth at your group's transect.
    c. Multiply the average depth by the width of the stream (it's on the big whiteboard) to find the area of your transect.
    d. Add your group's area with the other group's area and divide by 2. This is the cross-sectional area of our stream. This gives us an idea of how much water is in the stream between the two transects.
    e. Circle this number on the big whiteboard.



5. Now you need to know how fast the water is flowing. You'll need a partner and to be in groups of 2.
6. Partner #1 will go upstream to transect #1 with the ping pong ball. Partner #2 will go downstream to transect #2 with the stopwatch.
7. When your partner is ready, drop the ping pong ball into the stream at transect #1 and measure how long it takes to reach transect #2. Record this measurement (in seconds) on the big whiteboard.
8. You and your partner will need to repeat this test at least 3 times. Each time record your measurement on the big whiteboard.
9. When everyone has tested their ping pong balls at least 3 times, get an average of all the measurements.

10. Now, there's one final bit of math… to get the total stream flow, plug your data into the equation.

Solving the equation: **Stream Flow** $= \dfrac{\mathbf{L \times A \times C}}{\mathbf{T}}$

Stream Flow = $\dfrac{\_\_\_\_\_\_\_\_\_\_ \times \_\_\_\_\_\_\_\_\_\_ \times \_\_\_\_\_\_\_\_\_\_}{\_\_\_\_\_\_\_\_\_\_}$

L = length of the stream (it's on the whiteboard)
A = Average cross-sectional area (you calculated this and circled it on the whiteboard)
C = Correction factor

- Because the surface of some streams flow differently than the bottoms of some streams
- Does your stream have a rocky surface? Use 0.8 as the correction factor
- Does your stream have a muddy surface? Use 0.9 as the correction factor

T = Average travel time of a ping pong ball

What does this mean?

Stream flow is the volume of water that moves over a designated point over a fixed period of time.

Stream flow affects the amount of sediment carried by the stream. Sediment introduced to quiet, slow-flowing streams will settle quickly to the stream bottom. Fast moving streams will keep sediment suspended longer in the water and carry the sediment farther downstream.

River	Average Flow
Cape Fear River	110 m^3/s
Mississippi River	16,200 m^3/s
Amazon River	219,000 m^3/s