



HS FOCUS on PHYSICS:

Determining Big Chico Creek Stream Flow Rate

Anchoring Phenomenon:

Investigative Phenomena:

Background:

Materials needed:

4 plastic or metal stakes	String or rope
Tape measure long enough to go across the creek	Twist ties
Waterproof meter stick	3 sticks to float down the creek
Timer	

Procedure:

Part A: Determine the average surface flow time of a stick floating down the creek.

1. Anchor a string across and perpendicular to the creek. Use the stakes to hold it in place.
2. Anchor the second string either upstream or downstream from the first string. The goal is to have your strings be 5-8 meters apart. This length is (L).

Distance between strings (L)	
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3. Using a timer, record the times it takes a stick to float downstream between the ropes. The stick should be in the center of the creek as best possible. Complete 3 trials and find the average time (T).

Trial 1 Time	Trial 2 Time	Trial 3 Time	Average Time (T)
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4. Since the creek is not uniformly deep (do you notice the water is moving slower near the edges than the center of the creek and does not have a smooth bottom?), you must account for these differences. Circle the description that best matches the creek. This number is your creek coefficient (C).
- 0.8 if the creek is rocky
 - 0.9 if the creek is muddy
 - 0.85 if there is a mixture of mud and rock

Part B: Determine the average creek area for each section.

5. Using the tape measure, measure the width of the creek at one of your strings.

Upstream Creek Width	
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6. Divide the creek width into 8 equal sections. Place a twist tie at the center of the string. Keep dividing each section until you have 8 equal sections. **See example below.**
7. In centimeters, measure the depth at the center of each section with a plastic meterstick. Record the data below and find the average depth. Once you have the average depth in centimeters, divide that number by 100 to convert your depth to meters.

Upstream Depth

1	2	3	4	5	6	7	8	Avg. Depth (cm)	Avg. Depth (m)

8. Find the average area of the creek at the upstream location. To find the average area, multiply the average depth by the upstream creek width.

Upstream Width	Average upstream creek Depth	Upstream creek area
x	=	

9. Repeat this process for the downstream creek width.

Downstream Creek Width	
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Downstream Depth

1	2	3	4	5	6	7	8	Avg. Depth (in)	Avg. Depth (ft)

Downstream Width	Average downstream creek Depth	Downstream creek area
x	=	

10. Find the average of your two creek cross-section areas by adding them together and dividing by 2. This is (A).

Average creek cross-section areas (A)	
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Part C: Calculate stream flow rate.

11. To calculate any stream flow rate, you need the following:

Average cross sectional area (A) _____

Length of creek between the strings (L) _____

River coefficient (C) _____

Average float time (T) _____

Using the formula, Creek Flow = $(A \cdot L \cdot C) / T$, find the creek flow stream rate for your area!

NGSS

CCSS

CEPC

Lesson Resources:

Stroud Water Resources Center Macroinvertebrate Identification Key

stroudcenter.org/macros/key/

LaMotte 5882 Leaf Pack Experiments Stream Ecology Kit \$298 from Global Test Supply

D-Net

White collection trays

Forceps

Ice cube trays (for sorting)

Macroinvertebrate recording sheets (Project WET or Creek Watchers)

LaMotte low cost water quality monitoring kit

Nature Journaling Prompts