

# ADOPT-A-STREAM MONITORING EQUIPMENT BUILDING INSTRUCTIONS

## PHYSICAL PARAMETER SAMPLING

### STREAM FLOW METER

This project is a simple but accurate flow meter that measures the velocity of a stream. It is adapted from work by F. Glassner, 1955. H.B.N. Hynes, in his book, The Ecology of Running Waters, says of this device "...although crude, it gives results which are probably almost as reliable as those of more complex, and costly, micrometers." This adaptation is very simple, inexpensive, and easy to use. Limitations: It cannot be used in slow moving streams because the water will not move steadily and regularly through the tube if the flow is not very fast.

#### **Materials:**

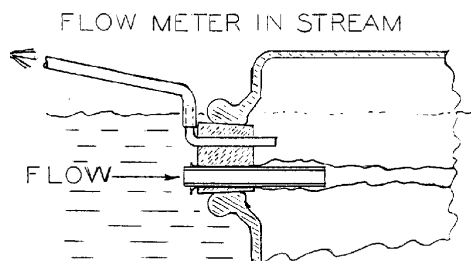
- 1 Bottle- about 1/2 liter with wide (2") mouth
- 1 2- hole stopper
- 1 glass tube 1/2" I. D. x 4" long
- 1 medicine dropper
- 1 plastic sandwich bag
- 1 pc. plastic fish tank tubing
- 1 small light float
- 1 250 ml graduated cylinder

#### **Tools:**

- bunsen burner or alcohol lamp
- knife
- inside calipers
- electric drill with 1/2" bit
- small triangular file

#### **Building Instructions:**

1. Widen one of the holes in the stopper with the drill so that the tube will fit snugly in it.
2. Remove the rubber part of the medicine dropper, and with the bunsen burner; bend the glass part of the dropper into a right angle at its midpoint.
3. After it has cooled, push the pointed end of the tube into the other hole in the stopper. Attach the plastic fish tank tubing.
4. Push the open end of the plastic bag up through the large hole from the bottom side of the stopper. Pull the bag through the hole far enough so that the whole open end is sticking out.
5. Carefully push the cut off test tube into the hole, inside the bag. Push it in so it is almost flush with the top of the stopper and protrudes below into the bag. You should now have a plastic bag, sealed except for the tube that protrudes down into it. Be careful not to cut or tear the bag.
6. Place the stopper in the bottle, with the bag inside the bottle. When you blow in the end of the plastic tubing, the bag should collapse.
7. Attach a small float to the end of the tubing, being careful that the tube remains unclogged.
8. To calibrate, calculate the area ( $A = \pi r^2$ ) of the open end of the test tube by measuring the inner diameter with the inside calipers.



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### STREAM FLOW METER (continued)

#### **To use:**

1. Firmly push the stopper into the bottle.
2. Grasp the bottle in your right hand, blow in the end of the tubing to collapse the bag, and immediately clamp your thumb over the opening of the large glass tube to keep the bag collapsed.
3. Let go of the piece of tubing and lower the bottle down into the water, facing upstream.
4. Remove your thumb from the opening and get it out of the way.
5. At the end of a set period of time, (for example 10 seconds), cover the opening with your thumb.
6. Remove the bottle, remove the stopper and bag assembly, and carefully pour all of the water out of the bag into the graduated cylinder.
7. Measure how much water flowed into the bag. To calculate the rate of flow, use the formula:

$$\frac{V}{A \times T} = s$$

Where: V = volume of water in the bag in cm<sup>3</sup> (same as milliliters)  
A = area of the opening in cm<sup>2</sup>  
T = time the orifice was opened  
s = velocity of flow in cm/sec.

8. Do this several times at the same point and at several points in the stream, and average the results.