SAVE OUR STREAMS IZAAK WALTON LEAGUE OF AMERICA

Flow Monitoring Instructions for Stream Monitors

The quantity of streamflow (also called "discharge") is an important factor in determining water quality and interpreting water-quality data. The potential effects of contaminants on drinking-water supplies and aquatic habitats depend largely on the amount of water flowing in streams. You may have heard the outdated adage that "dilution is the solution to pollution." However, more streamflow usually means that rivers and streams are carrying a greater magnitude of contaminants and sediment, in part because of overland runoff. When waters carrying these increased loads reach gulfs and bays, aquatic plants and animals can be greatly affected.

Monitoring should be conducted at the same station (location) each time. Carefully record the location of your monitoring station on your Flow Monitoring Data Form. Use your smart phone's GPS functionality to determine your longitude and latitude. NOTE: English units (inches and feet) are used for physical measurements because this system is most commonly used in the field of hydrology.

PREPARE A TRANSECT

Before you measure the streamflow, you must first define the area in which you are taking measurements. This is done by creating a *transect* – a straight line that defines a narrow section through the stream. At your monitoring station, carry one end of the rope across the stream and secure it around a tree, shrub, or boulder on the far bank, one to two feet above water level. On the near bank, across from where the first end was secured, tie the rope around a shrub/tree at same height, making the rope taut across and above the stream.

WIDTH

Although the rope used to define your transect extends onto the stream banks, the width measurement here is of just the water body. Measure stream width at a point that visually appears to be the average width of the stream from water's edge to water's edge.

1. Carry the end of the tape measure across stream to the far banks and hold it where the water meets the bank, directly along the transect (under the rope).
2. Hold the tape measure taut on the near bank at the water's edge (again, along the transect) and measure the stream width. Round the width to the nearest foot and record the measurement on the Flow Monitoring Data Form.

DEPTH

Streams are not the same depth all the way across, so we measure the depth at various points across the stream to find an average depth.

1. Divide the width by six to establish five equidistant points across the stream from shore to shore. (Use the calculator if needed.)
2. Clip clothespins to the rope at each of five equidistant points.
3. Using a yardstick, measure steam depth (in inches) below each clothespin. Record each depth measurement on the Flow Monitoring Data Form.
4. Convert the depth measurements to fractions in feet. Then convert them to decimal equivalents of each fraction and record the decimal equivalents on the Flow Monitoring Data Form. This will simplify the math calculations in determining streamflow later. For example,
   - 6 inches = 1/2 foot. One-half foot converts to .5 feet.
   - 20 inches = 1 2/3 feet. One and two-thirds feet converts to 1.66 feet.
5. Calculate the average stream depth by adding the five depth measurements together and dividing by five.

EQUIPMENT

- Rope (long enough to tie across the stream)
- Tape measure
- Yard stick
- Clothes pins
- Timer that measures seconds
- Flow Monitoring Data Form
- Calculator
- Whiffle ball with string – tie one end of string to the ball, measure out three feet, cut the other end of the string
- Clipboard (optional)
- Old sneakers or sandals that secure to your feet. Waders may be preferred in cold weather or for additional leg protection when water is cloudy.

AREA

A river may be moving at the same velocity as a tiny stream, but the river will put out many more cubic feet of water per second. To calculate the amount of water moving through the stream channel, we must first calculate the area in which we're taking measurements.

To calculate the area of the stream transect (the amount of stream water beneath the rope), multiply the average stream depth by the stream width. Record the result in square feet on the Flow Monitoring Data Form.

VELOCITY

Stream velocity is how fast the water is moving, measured in feet per second. Velocity will not the same at each point along the transect, which is why we take measurements at five different points and average them, just as we did width stream depth.

The velocity of the stream is measured using the "float technique, which involves timing how long it takes for a float to travel a specified distance from upstream to downstream. A whiffle ball works well because it tends to run below the water surface yet above the stream bottom, thus moving at an average speed within the water column. We use a whiffle ball with a 3-foot string attached.

1. Hold the whiffle ball with one hand and the end of the three-foot string in the other. Hold both in the water directly below one of the equidistant points on the *transect* (one of the five clothes pins). Hold the string close to the water surface.
2. Have someone with a stopwatch say "GO" while you release the ball but continue to hold the string in place.
3. When the ball floats to the end of the string (meaning the ball has stopped moving and the three-foot string is taut), stop timing. Record in seconds the time it took the ball to travel three feet.
4. Repeat the procedure at each of the five equidistant points along the transect (at each clothespin).
5. Calculate the average float time by adding the results for all five trials and dividing by five. (Use the calculator if needed.)
6. Find the average velocity for the stream by dividing the distance traveled (3 feet) by the average float time. Because each ball traveled 3 feet, dividing 3 feet by the average float time provides the average velocity in feet per second.

FLOW RATE

The flow rate, measured in cubic feet per second, is a measure of how much water the stream moves each second. Calculate the flow rate by multiplying the area of the stream transect by the average velocity.

NOTE: To submit your Flow Monitoring Data to the *saveourstreams.net* website, click on "Submit a Physical Report." The Flow Data appears at the top of that form. You do not need to complete the other Physical Monitoring Data to submit the Flow Data.