SOP-4.1.1.3 Stream Flow Using Float to Measure Velocity

Adapted from *Streamkeeper's Field Guide* (Murdoch, Cheo, and O'Laughin1996, p. 108) by Abramson M., Padick C., Takata-Schuemen E., and Taylor G. for The Malibu Creek Watershed Stream Team Field Guide.

Stream flow is measured by calculating the volume of water that passes a particular point in a stream within a specified amount of time. To calculate flow you must know two things: how much water a section of stream holds (volume), and how fast that water is moving (velocity). Stream flow can be determined by measuring the velocity of water and the cross sectional area of the stream. The formula to use when calculating stream flow is:

stream flow = velocity x cross sectional area

To measure velocity a float (orange peel) will be used to determine how fast the water is flowing. To calculate the cross sectional area of the stream, a stadia rod will be used to measure water depth at 1-foot intervals across the width of the stream (Figure 5-3).

Procedures for determining stream flow:

Pick a 20-foot long section of the stream that is straight and of uniform width. Water should be flowing evenly within this section without turbulence, obstacles or other disturbances. This section of the stream should be shallow enough for you to safely wade across and conduct the stream flow test.

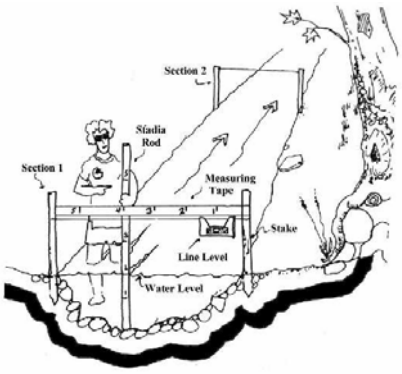
1. To measure the cross sectional area of a stream, place a stake at the wetted edge on each streambank.

2. Tie a string line to both stakes running across the stream, use the line level in the field kit to insure the string line is level.

3. Attach the loose end of the tape measure to one of the stakes using the spring clamp in the field kit, while one of your teammates holds the other end of the tape measure on the opposite streambank. The tape measure should be placed directly beside the level string line. Note: This location will be the starting line for the stream flow velocity trials.

4. Have one person take the stadia rod to measure the depth of the water at 1-foot intervals across the stream use the tape measure to establish these points. Always stand downstream of the tape line and stadia rod.

5. Continue to measure at 1-foot intervals until you reach the edge of the water on the opposite side of the stream bank. Call out the depth measurements at every 1-foot interval



so it can be recorded on the Stream Flow Field Sheet. Please read the section on How to Read the Stadia Rod.

6. Add up the depths on the Stream Flow Field Sheet. This is the cross sectional area for that section of the stream.

Note: Leave the string line attached to the stakes running across the stream. You will use this as a marker for the velocity measurement.

7. Repeat this procedure 20 feet downstream from where the first cross section was measured. This is where the finishing line for your stream flow velocity trials will take place. Compute the cross sectional area for this section and record this on the Stream Flow Field Sheet.

8. Add the two cross sectional area figures together and divide by two to get an average cross sectional area. Record this information on the Stream Flow Field Sheet.

Now you are ready for the velocity float trial part of the stream flow test.

1. Measure the length of the stream where the velocity float trials are to be conducted and record this information on the Stream Flow Field Sheet. This distance should be 20 feet, from starting line to finish line.

2. One team member stands in the stream at the starting line with an orange peel. Another team member stands downstream at the finish line waiting to retrieve the orange peel as it crosses the finish line. A third team member is standing on the bank next to the finish line with a stopwatch and clipboard.

The team member at the starting line drops an orange peel and as it passes the starting line, yells, "go". The person on the bank starts the stopwatch. When the orange peel passes the finish line the watch is stopped, the orange peel retrieved, and the time recorded on the Stream Flow Field Sheet.

4. Repeat this test five times moving from the left to the right side of the stream along the starting line. Doing this will give you a more representative depiction of stream flow along that section of the stream. Record the results on the Stream Flow Field Sheet each time.

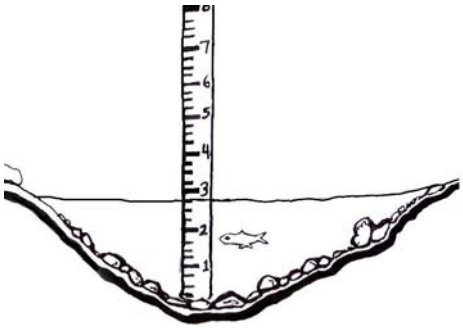
5. Add up the times for each of the velocity float trials and divide by the number of trials (5) to get an average velocity time. Record the results on the Stream Flow Field Sheet.

6. Use the Stream Flow Field Sheet to calculate surface velocity. Divide distance (20 feet) by average velocity time to get average surface velocity in feet per second. Next, multiply this result by the velocity correction factor of 0.8 to get average corrected velocity. The velocity correction factor has been added to adjust for the fact that water velocity at the surface is faster than water velocity closer to the bottom of a stream. Use this factor to get a more accurate stream flow calculation.

7. Finally, calculate stream flow by multiplying average correction velocity by average cross sectional area. Your result will in CFS (cubic feet per second). Record this number on the Stream Flow Field Sheet.

Reading the Stadia Rod

Hold the stadia rod plumb (straight up and down) and on the stream bottom. You are taking measurements at every foot along the horizontal tape measure that is stretched across the stream. The team is measuring at the four-foot mark on the tape measure. The stadia rod touches the top of the stream water at the two-foot mark. Record 2 foot on the Stream Flow Field Sheet in the box directly along side of the 4 foot horizontal box.



Field Sheets:

Record the results on the Stream Flow Field Sheet. A sample of the Stream Flow Field Sheet is provided on the following pages (Figure _).