Module #1

River Discharge Volume

Adapted from The Geography Site at www.geography-site.co.uk/

The discharge of a river is the volume of water which flows through it in a given time. It is usually measured in cubic feet per second. The volume of the discharge will be determined by factors such as climate, vegetation, soil type, drainage basin relief and the activities of man.

Materials

a velocity meter (flow vane)

If you don't have a velocity meter, measure the surface velocity by positioning 1 person upstream and another downstream. The upstream person should drop a piece of wood in the water and the downstream person should time how many seconds the wood takes to travel over a specified distance between people.

graph paper

A. Calculation

Discharge is very easy to calculate. The cross-sectional area of the channel is multiplied by the velocity of the water. However, finding the cross-sectional area and average velocity can take some time and effort. First, let's look at finding the easier of the two values – the average velocity.

B. Average velocity

The velocity of the water within a river channel varies according to depth and nearness to obstacles such as the bed, banks and boulders that could generate friction and drag. If you have recorded the surface velocity, a good estimate of the average can be found by multiplying your surface value by 0.8. For example, a surface value of 3 feet per second would be converted thus...

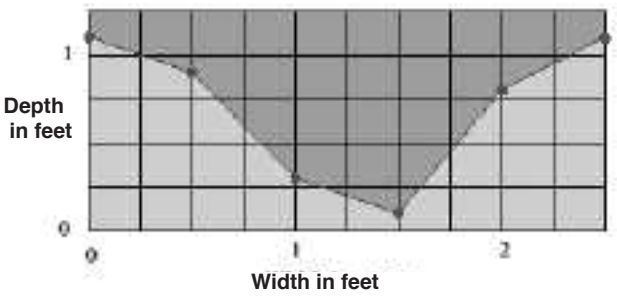
Measured surface value x 0.8 = average velocity

3.0 fs x 0.8 = 2.4 fs

Data collected throughout the velocity cross-section, using a velocity meter (flow vane) can be plotted on graph paper to work out the average velocity. Either way, don't forget to ensure that, for the final discharge reading, you use the correct units for area and time - feet and seconds.

C. Cross-sectional area

After recording the depth data in the field, the next step is to plot it on graph paper to produce a cross-section diagram. Once this has been drawn, it is possible to find the area simply by counting the number of squares in the 'wet' part of the diagram. This works quite well for small streams, but the number of squares on the graph paper rapidly goes into the hundreds and even thousands. (Keeping an accurate record of which ones you have counted is difficult without marking them on the actual diagram. This may not be desirable if you want to display the diagram afterwards.)



Count the grid squares or divide the diagram into squares and triangles to find the area. An alternative is to break up the cross-section into triangles and rectangles, find the area of each and then adding them together.

D. Record Test Results for the discharge volume of your river/stream