1. Reach Map

Create a very simple reach map. This is a top-down view of your reach with much less detail than your sketches. Things you should illustrate:

Is the channel straight or curved in your reach?

Which direction is the water flowing?

Indicate the location where you take measurements

Any major in-channel features (e.g. woody debris, large boulders, bridges)

A scale (hint: you'll measure a cross-section later)

2. Develop hypotheses

1. Where in you reach do you anticipate will have the highest velocity? Why do you think that?

2. How deep do you think the water is at its deepest point?

3. How fast do you think the water is flowing? How much variability is there in velocity (a little, a lot)?

4. Do you think the grain sizes will be uniformly distributed? Why or why not?

3. Grain size measurements

Choose a transect across your river reach and denote it on your reach map

Start close to one bank. Without looking at the bed of the stream, reach down with your index finger and pick up the first grain that touches your finger

Determine the diameter of the grain along the intermediate axis. We are using percent finer than, so the grain is classified as the largest size that it is smaller than (e.g. a grain with a 40 mm diameter would be classified as 45)

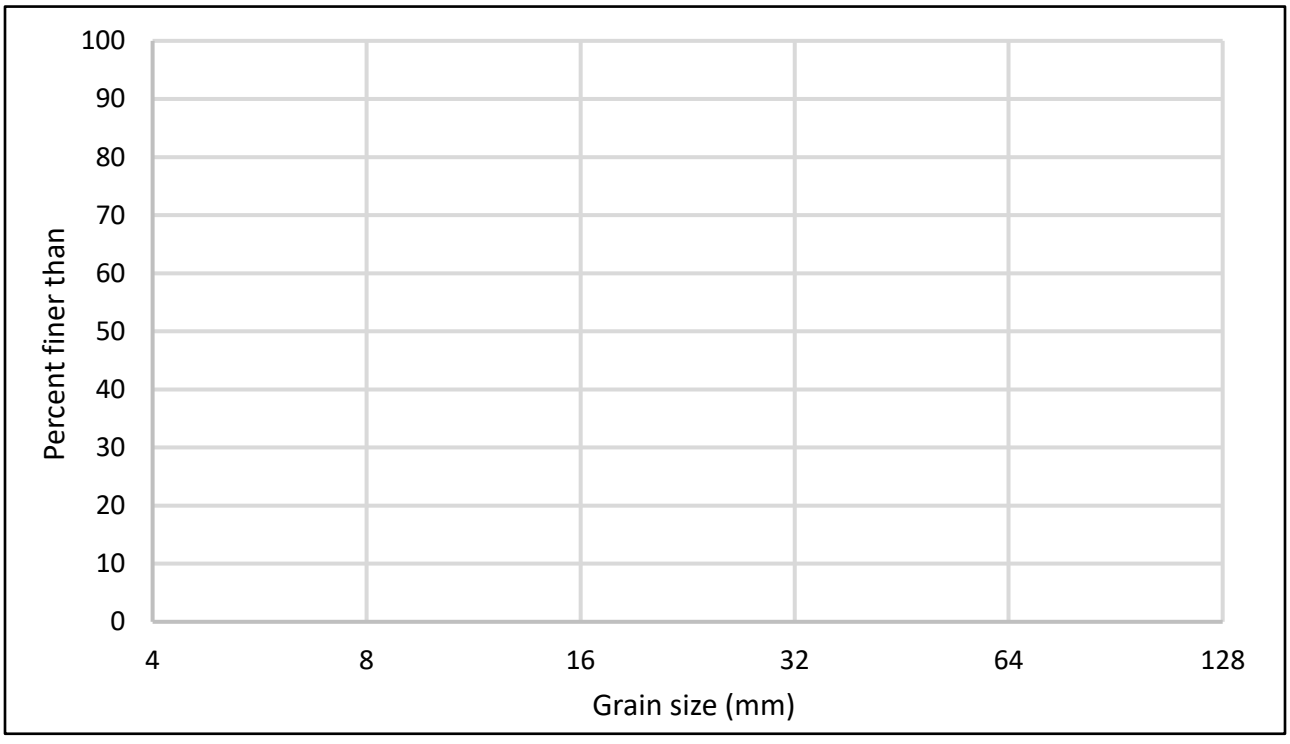
Walk across the channel perpendicular to flow to collect and measure grains along the transect

Once you have reached the opposite bank, move upstream or downstream of the original transect by ~5 steps and work your way back across the channel

Repeat the process until you have counted 100 grains

Plot the cumulative distribution of the grain size

Size (mm)	**Count**	**% of total**	**Cumulative %**
<4			
5.6			
8			
11.3			
16			
22.6			
32			
45			
64			
90			
128			



4. Discharge measurement

River discharge is the volume of water moving through a given cross-section per time

Choose a clear transect across your river reach (i.e. no obstructions) and denote it on your reach map

Stretch a measuring tape across the water with the zero end of the tape on the left bank (cross-sections are typically drawn looking downstream), a foot or two above water level. Secure the tape with nails and pull it taut.

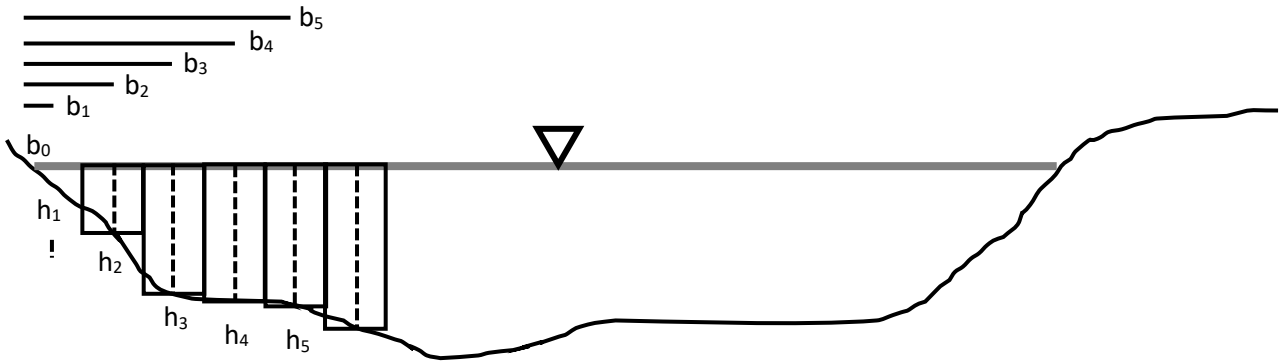
Measure the total wetted channel width and divide by 10 to determine the interval for your measurements.

Mark the water's edge in the datasheet – the distance along the tape and the depth (which is zero). Move from the water's edge to the first interval – note where you are along the measuring tape, measure the water depth, and take a velocity measurement

For our quick discharge measurement, one velocity measurement is sufficient. This should be taken at a depth 0.6 times the total flow depth (for a 1 ft deep channel, the measurement would be taken 0.6 ft down from the water surface, or 0.4 ft up from the bed)

Each velocity measurement should last 20+ seconds to make sure the velocity is stable and to get an average velocity

After measuring depth and velocity, move to the next location and repeat until you reach the opposite water's edge



Discharge is calculated as Q = b*h*v

Where Q is discharge, b is width, h is depth, and v is velocity

Our method is an approximation that breaks the channel into a series of rectangles, as pictured above

To calculate discharge using this method, we calculated the discharge in each of our small rectangles as:

$q_n = \frac{b_{n+1}-b_{n-1}}{2} * h_n * v_n$, for example: $q_3 = \frac{b_4-b_2}{2} * h_3 * v_3$

And the total discharge is the sum of the discharge in each of the small rectangles.

Station number	Distance along tape	Depth	Velocity 1	Velocity 2	Average velocity
0 (water edge)					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

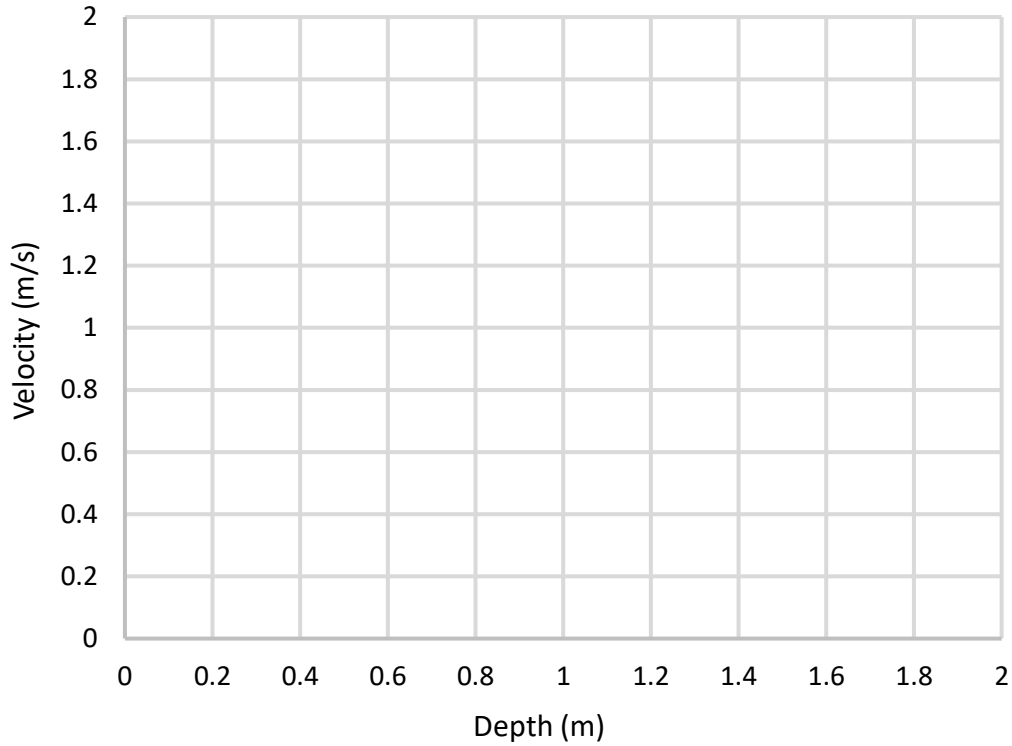
4. Spot velocity measurements

Depth (m)	Velocity (m/s)

Choose places of interest in your reach. Target areas with different depths and/or with interesting hydraulic features (boulders, logs, etc.). Mark the points where you measure on your reach map.

Measure and record the total depth at each point. Measure and record the velocity at 0.2 times the total depth (near the top of the flow).

Plot the depth and velocity on the graph below.



Questions

1. Based on your time in the field, give 5 keywords that you would use to describe your reach.

2. How did your pre-field work hypotheses about depth, velocity, and grain size compare to what you actually measured?

3. Calculate the total discharge from your measurements in Part 3.

4. Looking at the plot from your velocity measurements in Part 4, are there any trends in depth and velocity? For example, do deeper areas have higher velocity?