

Water Sampling Investigation

Physical Measurements

☐ 1. Temperature

- Use regular lab thermometers to measure both air and water temperatures.
- Measure the water temperature in the same place and the same level where you will be taking the dissolved oxygen water sample.
- For the water temperature, put the tip of the thermometer a few centimetres below the surface.
- Wait one to two minutes before reading the temperature. Make sure you read it while it is still in the water.

☐ 2. Water Depth

- Use a two meter stick to measure the depth of the stream in four different spots in your sampling area.
- Record the four trials.
- Calculate the average depth.

☐ 3. Stream Flow Rate

a. Mark out a section of the stream to test

- Put a marker such as a flagged stake at the start point on a straight section of the stream.
- Measure a distance of 10m to 15m along the bank. Record the distance between stakes.
- Put another marker at the end point.

b. Estimate the area of the stream's cross-section

- From the start point, measure the distance across the stream from one side to the other (width).
- Take depth measurements straight across the waterway to the other side.
- Measure the depth of the stream at regular intervals using the 2 meter measuring stick.
- Add up all of the depths and divide by the number of measurements to get the Average Depth (depth).
- For a more accurate estimate you can repeat this process half way between the start and end, and at the end point.
- Calculate the area of the stream cross section using the formula $A = w \times d$ (Area equals total width times average depth).

c. Run the time trials

- Release a float in the middle of the stream at the start point and start the timer. Use either a retrievable float or a biodegradable object such as a radish or orange.
- Stop timing when it reaches the end point.

- Repeat the time trial two more times.
- d. Calculate the average velocity
- Calculate the velocity of each trial using the formula $V=d/t$ (velocity equals distance travelled divided by travel time (units of m^2))
 - Calculate and record the average velocity.
- e. Stream Flow Rate
- Calculate the stream flow rate using the formula $Q = A \times V$. (Flow Rate (m^3/s) = Total Average Cross Section (m^2) x Surface Velocity (m/s))
 - Since stream beds vary from rocky and rough to smooth, you have to “correct” the surface velocity to reflect the velocity on the bottom of the stream. The more rocky the bottom the lower the correction number. Choose which of these situations apply to the stream.

| Type of Stream | Velocity Correction Factor |
|-----------------------------------|----------------------------|
| Regular channel with smooth sides | 0.85 |
| Deep slow, moving stream | 0.75 |
| A small stream with a smooth bed | 0.65 |
| A quick, turbulent stream | 0.45 |
| A very shallow, rocky stream | 0.25 |

Flow Rate “Q” Calculation:

- The final corrected stream flow rate is $\text{Flow Rate } (m^3/s) = \text{Total Average Cross Section } (m^2) \times \text{Surface Velocity } (m/s) \times \text{Correction factor}$

Chemical Tests

4. pH
- Collect a water sample in the water sample bottle. Put 5 mL of the sample into a test tube.
 - Use the pH indicator from your water testing kit to measure the pH of the sample. Follow the directions for the kit to test and identify the pH.
 - Record the pH on your data sheet.
5. Dissolved Oxygen
- Collect a new sample of water. Put 5 mL of the water into a test tube.
 - Follow the instructions of the Dissolved Oxygen test kit to add the necessary test solutions, making sure you wait for the times indicated.
 - Observe the colour changes and interpret them according to the test kit instructions.
6. Nitrates
- Collect a new sample of water. Put 5 mL of the water into a test tube.
 - Follow the instructions of the nitrate test kit to add the necessary test solutions, making sure you wait for the times indicated.

- The measurements are in parts per million (ppm). You can follow your test kits instructions to measuring.

- 7. Nitrites
 - Collect a new sample of water. Put 5 mL of the water into a test tube.
 - Follow the directions on the nitrites test kit.

- 8. Ammonia
 - Collect a new sample of water. Put 5 mL of the water into a test tube.
 - Follow the directions on the ammonia test kit

- 9. Phosphates
 - Collect a new sample of water. Put 5 mL of the water into a test tube.
 - Follow the directions on the ammonia test kit

- 10. Coliform
 - Follow directions of the test kit.

- 11. Turbidity Test
 - Use the turbidity test as directed by your teacher.
 - You can compare your turbidity sample with the sample chart in this link:
<https://sciencefirstpeoples.weebly.com/salmon.htm>

- 12. Invertebrate Identification
 - Gently disturb some of the rocks in the pools to find some of the larger invertebrates.
 - Take pictures of them, making sure to record the time and date. Make sure to leave the area as pristine as possible.

- 11. Plant Identification
 - Identify the plant species in and around your water quality sampling site.
 - Plants can be identified using the “E-Flora” Website at
<https://tinyurl.com/fnesc67>