The Water Clarity Tube

A simple Citizen Science tool to monitor water clarity, an indicator of turbidity and total suspended solids

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GroundTruth
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1. INTRODUCTION AND BACKGROUND

1.1. What is a Clarity Tube?

There are several methods for testing water clarity; some of these methods are very accurate but very costly, often not practical options for projects that require multiple samples and less accuracy.

The clarity tube measures water clarity, which decreases with an increase in turbidity or suspended solids. The Water Clarity Tube can be used in rivers with a range of flow regimes, and can be used in shallow or deep areas, and where there are aquatic plants, making it a practical tool to use in a variety of aquatic environments.

Studies done in California on the use of the clarity tube in water quality measurements, found that the clarity tube measurements showed a strong relationship to turbidity and total suspended solids.

The clarity tube is easy to use. It is inexpensive, robust and easily transported tool. Several studies commend the reliability, ease and rapidity of using the tool. It can be use by farmers, school groups, citizen monitoring groups and local government agencies and more. The South African river health program has been utilising the water clarity tube as a tool for monitoring water clarity in the absence of expensive turbidity meters.

1.2. Water clarity tube design

The Water Clarity Tube is made of transparent Perspex. The tube is 100cm long and has a diameter of 50 mm. A black stopper-cap seals the tube when it is full of water. The tube has a metered scale (in centimetres) on the side of the tube (Figures 1.1 and 1.2).

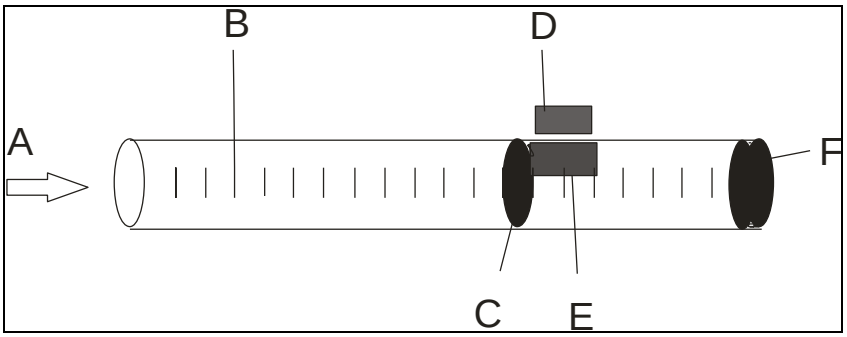

Figure **Error! No text of specified style in document.**.1 Diagram of Clarity Tube components. A: Clear base for viewing the disk; B: Metered scale on the side of the tube; C: Black disk; D & E: Magnets for moving disk; and F: Black stopper-cap for sealing the tube

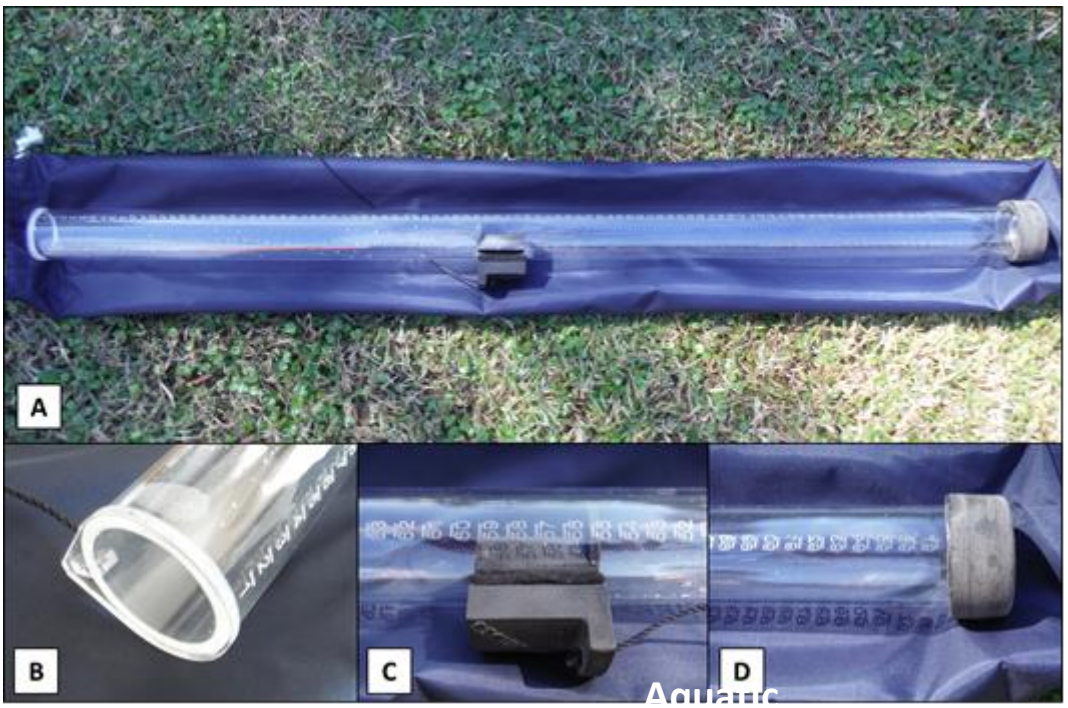

Figure 1.2 Photos of the components of a water clarity tube. A: The full length of the tube, with the protective cover; B: Clear base for viewing the disk; C: Magnets for moving disk; D: Black stopper-cap for sealing the tube

2. HOW TO USE THE CLARITY TUBE

- Decide on a location where you will collect your sample. Make a note of the site, either with a GPS or on a map. Name your site so that you can find the site again in the future.
- The best way to collect a water sample is to place the water clarity tube, with the open end facing upstream. Dip the opening into the water and let the tube fill with water – make sure there are no bubbles!
- If you cannot put the clarity tube into the water, you can collect the water from the river or pond in a bucket. The clarity tube does not need to be placed in the water. The water must then be poured into the 1m x 50mm clear tube until it is full (i.e. no bubbles)
- Once the clarity tube is completely full, with no bubbles, seal the clarity tube with the black stopper-cap – make sure it is on completely.

IMPORTANT NOTE: Don't stir up sediment when you are collecting your sample. This will affect your readings!

- The tube is now full of water and you can start to take your water clarity measurement.
- Hold the tube horizontally, with the clear base facing toward you. If there are any bubbles in the tube; tilt the tube slightly so that they gather at the stopper-cap end - this will prevent bubbles from interfering with the reading you will take. Stand with your shoulder perpendicular to the sun, so that when you lift the clarity tube up to your eye, the sun is shining into the tube at 90 degrees.

Figure **Error! No text of specified style in document.**.1 Make sure that the clarity tube is 90^{o} to the sun

- Use the magnets to move the black disk inside the clarity tube to the 1cm marker. Look through the clear base of the clarity tube and slowly move the black disk (using the magnet system) away from you. Make a note of the centimetre reading where the black disk is no longer visible.
- Now, push the disk all the way to the stopper-cap. Then looking through the clear base, slowly move the disk toward you. Make a note of the centimetre reading where the black disk becomes visible.
- To calculate the Water Clarity, calculate the average of the two readings you obtained and make a note of your reading.

Figure **Error! No text of specified style in document.**.2 The black disk that you will move using the magnets

IMPORTANT NOTE: Readings do not change significantly if you are standing in shade or sun. However, DO NOT TAKE READINGS IN DAPPLED LIGHT; this will influence the reading. Make sure you are either standing in full sun or full shade!

CLARITY TIP: Get someone to help hold the clarity tube if it is too heavy. REMEMBER: do not cast any shadows onto the tube when shifting the black disk – this will affect your readings!

3. MONITORING PROTOCOL

Typically, information is gathered with the once-off collection of data from a particular site, however much more information becomes available with repeated sampling of the same sites. When repeated sampling is done, you can start to see trends (or patterns) developing from the information.

If you want to develop a monitoring protocol, it is important to first figure out what question you are trying to answer. For example, "Is the water flowing out of this wetland clearer than water flowing into the wetland?"

Once you have decided on a question and a site where you will work, decide on a monitoring routine that you will follow. Consider items such as season (rainy or dry), access to the site when you need it, landowner permission, and so on.

Routine monitoring should be conducted at a constant time interval on a designated day (e.g. the first Monday of the month). For all monitoring, make notes on the condition of the site, and if anything has changed since the previous data collection period. Remember to take measurements when there are significant environmental events, such as heavy rainfall, spills or other disturbances. Additionally, for event-driven measurements, make notes on what the event was and the duration for which it continued (e.g. 140mm rainfall over 16hrs prior to sampling).

4. CARE AND MAINTENANCE

- To ensure sediment or debris do not contaminate samples from different sites, pour clean tap water into the clarity tube and use an elongated bottlebrush to scrub the sides of the clarity tube clean after each use. Residue from different water bodies may affect the water clarity readings. This is especially important if you are sampling multiple water bodies on the same day.
- If the clarity tube is going to be stored for more than a few days, place it upside down with the black stopper-cap off to allow the tube to dry before storage.
- Do not store in a warm, dark place if there is any moisture in the tube as this will cause algae to grow inside the tube interfering with future readings. If algae do begin to grow in the tube, mix 5ml of bleach into 1L of water and wash out the tube.
- Do not place the viewing disk on the ground; as this will scratch the disk and affect the water clarity reading.

5. ACKNOWLEDGEMENTS

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