

Data Collection and Sampling for Stagnant Water Bodies

Today, one of the biggest and most common issues is the eutrophication of surface water resources. Eutrophication accounts for roughly 70% of all freshwater withdrawals globally, and over 90% in most of the world's least developed countries.

Before heading into a bioremediation project for any stagnant body of water, it is essential to understand the underlying water quality. Obtaining a representative sample is key to ensure the lab readings reflect what is happening in the lake or pond.

The purpose of the following is to serve as a guideline for collecting a composite sample in any large body of water.

Data Collection:

- Estimate the area of the pond.
- Draw top view of the pond showing all inlets and outlets pinned (use Google Maps).
- Estimate flow of all inlets to determine the primary source of water to the pond.

Materials

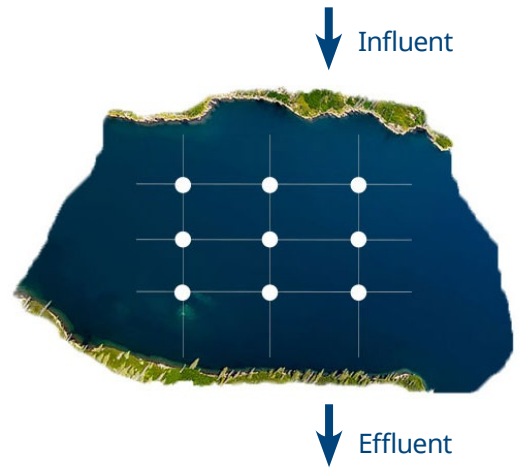
- Boat, life jackets, trolling motor (and required batteries), tether and anchor.
- Map/satellite photo of area and GPS device.
- 0.5 L wide mouth sample bottles (PE).
- Sample bottles & 20 L bucket.
- 10 L bucket with handle and 30 m of rope.
- Telescopic 5 m rod for sample collection.
- Cooler and Ice packs for collected samples.
- Conc. - H_2SO_4 & Conc. HNO_3 .
- 0.1 N KCl for conductivity calibration.
- Secchi disk.



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Sampling by Boat

- Obtain a map or satellite photo of the area. Estimate total surface area and take photographs from the shore including clear references or landmarks.
- Set a grid of at least 9 (3x3) sampling points per each (1) hectare of surface water and label each sampling point distinctly. All sampling points should be at least 3 m away from the pond / lagoon's edge.
- Do not touch inside of the bottle. For biological analysis, the bottles should be sterilized before sampling.
- Before leaving the dock, make sure you check all the needed materials are on board the boat (as well as life jackets and a suitable trolling motor).
- Safely board the boat. As a general rule – only 1 occupant should stand at any time to avoid accidental imbalances.
- Anchor the boat at the first sampling point (lower the anchor slowly to minimize disturbing the sludge layer).
- Record time, date, temperature, and GPS coordinates for the given sampling point.
- Using a hand-held device, record all data parameters. Store the parameters in the device and write them down on a note pad.
- Rinse the sample container three times with the sample before it is filled.
- Draw one (1) 0.5 litre sample from the pond surface and one (1) 0.5 L sample from 1 m depth. Similarly, take samples of sludge from same site – minimum 50 g Wet weight. Refer to Bottom section for sludge testing.
- Combine both the surface and 1 m depth samples into the 20 L bucket. Make sure the bucket is covered before moving onto sampling position 2.
- Repeat the same procedure for all sampling points (make sure you have enough 20 L buckets to consolidate all samples – one 20 L bucket can be used for 32 samples i.e. 16 L or 16 Sampling point).
- Once back on land: mix the contents of the 20 L bucket thoroughly. Collect a total of two (2), 0.5 L samples, each sample should be collected in 250 mL aliquots; the contents of the bucket should be mixed thoroughly between each 250 mL sample collection.
- Label each sample bottle and place them in a cooler with ice. Make sure the samples are delivered to the lab within 24 hours of collection. Samples should always be stored $1^{\circ}\text{C} < T < 4^{\circ}\text{C}$.



Sludge Sampling

- Lower the Secchi Disk slowly until it rests on the surface of the sludge layer. Record water depth.
- Lower extension pole/Hollow PVC pipe and push through sludge until it hits the bottom of the lagoon and record the depth. Record the difference as sludge depth.
- Take the sludge sample which is either obtained using Sludge Judge or other available technique in a 20 L bucket.
- After collecting all sludge samples, mix the contents of the bucket thoroughly and make two sections. Store one sample directly in a non-metallic box. This box is for total volatile content. Add Conc. HNO_3 to the other sample and store it in a non-metallic box. This sample is for metallic testing.



Secchi Disk



Sample bottle and holder

Bottling of Samples

- **Biochemical Oxygen Demand (BOD):** Samples for BOD analysis should be stored at $1^\circ\text{C} < T < 4^\circ\text{C}$ and in the dark as soon as possible after sampling.
- **Chemical Oxygen Demand (COD):** If samples collected for chemical oxygen demand (COD) analysis cannot be analyzed on the day of collection they should be preserved below pH 2 by addition of concentrated sulphuric acid. Similarly, for - ammonical nitrogen, total oxidized nitrogen, and phenol analysis.
- **Metal:** Samples which will be analyzed for the presence of metals should be acidified to below pH 2 with concentrated nitric acid. Samples can then be kept up to six months before analysis.
- **Bacteria:** Analysis of bacteriological samples should be started and analyzed within 24 hours of collection and should be stored at a temperature below 4°C and in the dark as soon as possible after sampling.

Overall

Sr. No.	Analysis	Container	Volume	Preservation
1	General - (SS, TDS & Major ions)	Glass, PE	1000	-
2	COD, NH ₃ , NO ₂ ⁻ , NO ₃ ⁻	Glass, PE	500	H ₂ SO ₄ , pH
3	O-PO ₄	Glass	100	-
4	BOD	Glass, PE	1000	4°C, Dark
5	Coliform	Glass, PE	300	4°C, Dark
6	Heavy Metals (Cd, Zn)	Glass, PE	500	HNO ₃ , pH
7	Mercury	Glass	1000	HNO ₃ , pH
8	Pesticides	Glass, Teflon	1000	4°C, Dark

Count total number of samples required for testing. Label the sample container properly, by attaching an appropriately inscribed tag or label. The sample code and the sampling date should be clearly marked on the sample container or the tag. Time of sampling is extremely important and should be labelled on sample bottle and Sample Data sheet. **Mark type of testing to be done and contents like H₂SO₄ or HNO₃ or others if added.**

Depending upon the requirement and facility available, make different sampling bottles for different testing.

- One for BOD, DO, Ortho phosphate, pesticides and organic analysis including pesticides – 2 L each sampling.
- One for COD, Ammonia, Nitrite & Nitrate – 1 L each sampling.
- One for Heavy metal contents. 500ml for each sampling.
- One General for Orthophosphates, TSS, TDS, pH, conductivity, and others.

For routine testing, only 3 different types of bottles will be needed (for BOD, COD, and General.)



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