

Water Quality Sampling Protocol

Protocol developed for the Réseau de surveillance volontaire des lacs (RSVL)

2017
4th edition



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les changements climatiques (MELCC) and Conseil régional de
l'environnement des Laurentides (CRE Laurentides), 2017.
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Introduction

The present protocol is for lake associations and organizations wishing to carry out water sampling within the Réseau de surveillance volontaire des lacs (RSVL) to document lake water quality regarding eutrophication.

In order to obtain results that are representative of lake water quality, it is important that the sampling be done in a rigorous and methodical manner. This protocol presents the steps to follow and the practical work required to properly carry out water sampling.



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Parameters analyzed

The three parameters analyzed in the RSVL are:

- Total phosphorus (TP), by nature the scarcest nutrient in lakes. TP is present in small amounts relative to the demand of algae and aquatic plants for growth. There is a direct relationship between phosphorus concentration, lake productivity, and trophic level. Eutrophic lakes generally have a high phosphorus concentration;
- Chlorophyll a (Chl a), a green pigment found in plants and algae. This parameter is thus an indicator of the biomass (quantity) of suspended microscopic algae in a lake water. Chlorophyll a concentration increases in relation to nutrient concentrations, especially phosphorus. There is therefore a relationship between chlorophyll a and the trophic level of a lake. Eutrophic lakes are often subject to a significant production of algae;
- Dissolved organic carbon (DOC), a general indicator of the amount of organic material dissolved in water as a result of the decomposition of plant or animal material. DOC concentration is used to evaluate the presence of humic substances causing the yellow or brownish colour of lake water. These humic substances are common in wetlands such as bogs, swamps and marshes. Water transparency, and hence Secchi disk readings, decrease with an increase in dissolved organic carbon concentration.

Information obtained from these three parameters is completed by regular measuring of water transparency. Transparency diminishes with the increase in the quantity of algae in lake water. There is thus a relationship between water transparency of a lake and its trophic state. Eutrophic lakes are generally characterized by low water transparency. For further information on this parameter, and on how to measure it, consult the *Protocole de mesure de la transparence de l'eau* in the *Trousse des lacs of the Bleu Laurentides* program at the following address: www.environnement.gouv.qc.ca/eau/rsv-lacs/transparence.pdf.

PLEASE NOTE

The chemical form of phosphorus to be considered in order to be able to draw conclusions about the health of a lake is total phosphorus (TP). The laboratory analytical method must allow for the detection of its presence at trace levels.

The analytical methods used by the *Centre d'expertise en analyse environnementale du Québec (CEAEQ)* for the RSVL can be found at the following address: www.ceaeq.gouv.qc.ca/methodes/chimie_inorg.htm

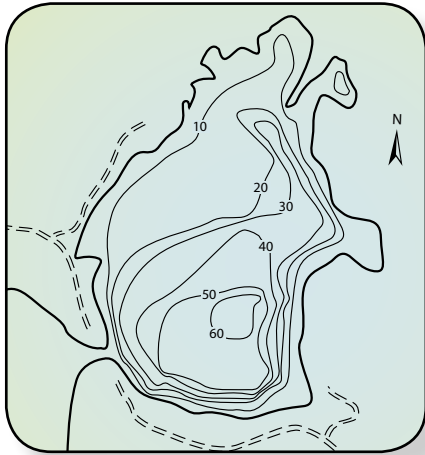


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Here are the bottles contained in your sampling kit. The large white bottle «Contrôlée» is used for sampling water. The brown bottle is used for the analysis of Chl a, whereas the two other small bottles are used to measure DOC and TP, respectively.

Location of the station

The sampling station's location designates the area in the lake where water samples should always be taken. During the first year of lake monitoring under the RSVL, this location is determined according to the following conditions:



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Map example

- If the bathymetric map for your lake is available, it was provided to you and indicates the location of the sampling station, which is generally in the deepest zone of the lake (deep hole);
- If there is no bathymetric map available for your lake at the Ministère, it was not possible to locate the sampling station beforehand. However, if you have a bathymetric map, you will be able to use it to locate the station in the deepest zone yourself;

- If you do not have a bathymetric map, but you know where the deepest zone of the lake is, locate your sampling station and mark it in your lake's space on the RELAIS platform;
- Finally, if you do not know where the deepest zone of the lake is, please locate the station in the centre of the lake and mark it in your lake's space on the RELAIS platform;
- It may be that for reasons known to you or due to particular conditions of the lake, that the station is not located in the deepest zone. The location of the station should be determined after discussion with a member of the RSVL.

IMPORTANT!

If you are the one who must determine the location of the sampling station during the first monitoring year, do so on the RELAIS platform. Consult the section "Déplacer une station" (moving a station) in the user guide at the following address: <http://www.environnement.gouv.qc.ca/eau/rsvl/relais/guide-utilisateur.pdf>.

Sampling Frequency

The RSVL currently proposes a monitoring program involving three water samplings to be carried out in June, July, and August. Every year, the RSVL sets the sampling dates. It is important to respect these dates, as they have been established in accordance with the laboratory's schedule, the courier services, and statutory holidays.

To accurately estimate average concentrations of total phosphorus, chlorophyll a and dissolved organic carbon, the RSVL strongly recommends taking water samples for two or three consecutive years. For more information on the water quality monitoring program, please consult the Ministère's website at the following address: <http://www.environnement.gouv.qc.ca/eau/rsvl/index-en.htm#what->

Equipment needed

This is the equipment you will need for water sampling:

- A boat that can be anchored over the deep zone of your lake
- A home-made bottle holder
- A small polystyrene foam cooler containing:
 - One 500-ml sampling bottle labelled "bouteille contrôlée";
 - One glass bottle with a 50 ml fill line (for the determination of trace level total phosphorus);
 - One 125-ml white plastic bottle with acid (for the determination of dissolved organic carbon);
 - One 250-ml brown plastic bottle (for the determination of chlorophyll a);
 - One pair of gloves;
 - Two ice packs.



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Sampling procedure

Step 1 – At home

- We ask that you respect the sampling dates that we have determined. **Also, note that water sample shipments must not be made Thursday, Friday, Saturday, or Sunday.**
- A few days before the first water sampling, make sure that your area is served by the Dicom courier service. You can reach them at this number: 1 888-761-2345.

If Dicom does not serve your area, you will have to make arrangements to drop your cooler off at a business, post office or other location served by the carrier. In that case, it is very important to verify with the people to whom you give your cooler that the carrier will pick up your package the same day.

- The day before your sampling date, freeze your ice packs.
- The day before or on the morning of your sampling (before 8:30 a.m.), contact the Dicom courier service at 1 888-761-2345 to request pick-up of your cooler at the address that you verified beforehand.

Note that, for practical reasons, you may also choose to bring your water samples “into town” to ship them from your permanent residence or your workplace. The important thing is to make sure that the time between taking the sample and its delivery to the lab does not exceed 48 hours.

- Using a permanent marker, write your RSVL number on each of your bottles. The number is given to you when you join the RSVL.

VERY IMPORTANT!

Planning your package shipment is very important, as we must receive your samples at our laboratory **within no more than 48 hours** from the time of sampling.

PLEASE NOTE

We recommend that you always make a note of the number found under the bar code of the DICOM shipping label. This number facilitates finding a lost package, and allows you to track your package delivery online at the following address: <https://www.dicom.com/en/express/home>

Step 2 – In the boat

- Using rubber bands, attach your 500-ml bottle to your bottle holder (e.g., a small holder with an eyelet). This bottle will be used to fill the other three bottles. **It must only be used for one given station.**
- At the last minute, remove the cap, being very careful not to touch the inside or the neck of the bottle.
- Lower the bottle into the water at a steady rate so that there is one metre between the neck of the bottle and the water surface (use a coloured mark placed on the rope or stick) and pull it up. Ideally, you should see bubbles during the entire maneuver up to the time you remove the bottle from the water.
- Empty the bottle into the lake. This step makes it possible to rinse the container with water from the lake and lets you practice the sampling maneuver. Repeat as needed.

CAUTION!

It is very easy to contaminate a water sample, as phosphorus may be found in droplets of saliva, in dust, or in pollen particles carried by the wind, etc. **You must therefore be meticulous when handling your equipment.**

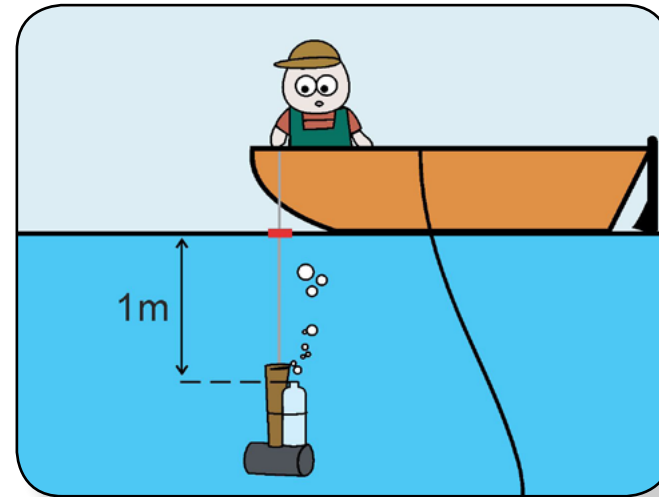
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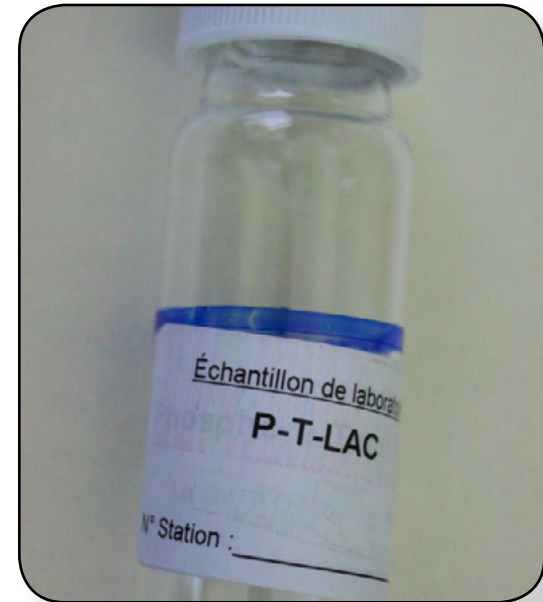


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- Lower the bottle into the water again to a depth of one metre and proceed with the water sampling.
- Screw on the cap and remove the bottle from the bottle holder.
- Put on the gloves provided in your sampling kit. **These gloves must only be used once.**
- After shaking the sampling bottle well, fill the small glass bottle labeled “P-T-LAC” up to the 50-ml mark and screw on the cap. Put this bottle back in its paper bubble wrap pouch to protect it and avoid breakage during shipment.
- Then fill the white bottle with the C.O.D. (DOC) label up to the shoulder. It must not overflow, as this bottle contains a few drops of acid.



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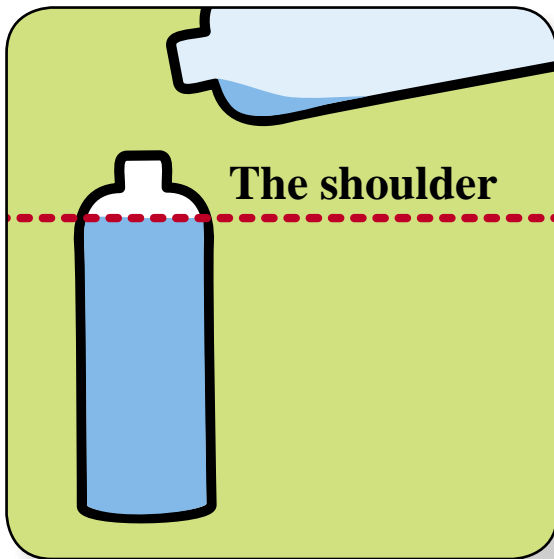
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The bottle used for phosphorous analysis is made of glass, with a 50-millilitre fill line. No preservation agent is used in this bottle.

PLEASE NOTE

You can recycle the empty 500-ml bottle that was used for sampling, as you do not have to return it to us.

- Finally, fill the brown bottle up to the shoulder, and screw on the cap.
- Place your water samples in the cooler with the ice packs while waiting to put them in the refrigerator.
- Before leaving the station, take a measurement of the water's transparency using the Secchi disk, following the instructions for the appropriate protocol. Write down this measurement, as well as the date and the time on the sheet used to record your readings.



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How are additional bagged bottles to be handled?

Some of you will have extra bottles in a paper bubble wrap pouch in your kit. These bottles are part of our quality-control program that includes “field blanks”. This allows for verifying whether shipping, bottles handling, or the environment in which the sampling is done contaminates the water samples with phosphorus. The procedure is explained on the label put on the bag containing these bottles.



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The field blank

The field blank is done at the end of your sampling, in the boat, at the precise location where you took your water samples and **after having put on a new pair of gloves**. It is made up of two bottles.

Bottle A is filled with ultra-pure water. Simply empty it into bottle B, and screw the cap on tightly. These two bottles must be put back in the original pouch and returned in the cooler to our laboratory at the same time as the water samples.

Step 3 – Back at home

- Place your water samples in the refrigerator as soon as possible so that they have time to chill before Dicom has them in their care (for at least four hours).
- Put the ice packs back in the freezer.
- Fill in the “Sampling date” and “Time of Sampling” sections on the *Analysis Request* form.
- Fill out the “Sender” section on the Dicom shipping label (waybill).
- At the time of shipping:
 - Place the two frozen ice packs and your water samples in the cooler;
 - Attach the completed *Analysis Request* form that you have placed in a watertight Ziploc bag to protect it from humidity;
 - Before sealing the cooler tightly, make sure you have complied with the shipping requirements by referring to the checklist attached to the lid;
 - Attach the completed Dicom shipping label to the cooler’s lid.
- A few days after receiving your water samples, the lab will return the cooler and ice packs to you for your next sampling.

CAUTION!

It is very important to attach the Analysis Request form to your water samples. The lab uses it to verify the 48-hour conservation period and ascertain the provenance of the samples and the analyses to be performed. **Bottles received without analysis requests may be rejected.**

For further information, contact us at one of the following numbers:

- For call in the Québec region:
418 521-3987
- For long-distance calls:
1 877-RSV-LACS (1 877 778-5227)

You can also contact us by email at the following address: rsvl@environnement.gouv.qc.ca or the **RELAIS** platform.

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