Water Quality Monitoring Guide

You are a new coordinator and you've inherited water quality monitoring sites.
Things to ask:
Why are these sites being monitored? Are there issues, past problems, new developments, new farmers, new construction/old construction? Fish kill? Is there a need to fill an information gap or to do trend monitoring? Who will use this data? What is your budget/resources for water monitoring?
If not, could you reduce the number of monitoring sites on that stream/branch?
Once you determine (if you can) why these sites are being monitored-look at the past data.
Do these sites fluctuate in numbers a lot? If yes, keep monitoring.
No? Look at your current needs on staff? The community? Do these sites need to be monitored? It's good to have legacy data at the same location, however, maybe they only need to be done four times a year if there haven't been issues in the recent past.
Do you have multiple sites on the same branch?

If so, why?

If there were legacy (historical) issues, do you still have them?

This handout is designed to get you thinking about your current water quality monitoring protocols. It should not be used as a replacement for the Wet-Pro courses offered by Atlantic Water Network, but as a guide to help you maximize your time to collect the best data. When in doubt about any monitoring methods, please reach out to your provincial team biologists.

- Kyel Kynsh (Surface Water Biologist): kmknysh@gov.pe.ca
- Rosanne MacFarlane (Freshwater Fish Biologist): remacfarlane@gov.pe.ca
- Mary Finch (Watershed Ecologist): mrfinch@gov.pe.ca
- Karalee McAskill (Watershed Coordinator): kmcaskill@gov.pe.ca

Or contact Rebecca Ramos-Armstrong (PEI Watershed Alliance, Monitoring Specialist): peiwaequipmentmanager@gmail.com

Groups conduct monitoring for a variety of reasons, including:

- Defining the natural characteristics, trends, and variations within a watershed
- Identifying problem areas within a watershed
- Filling gaps in existing datasets
- Assisting governments in establishing comprehensive regional data

It is important to have a clear purpose before you begin monitoring. Deciding on your goals upfront will help ensure your program is intentionally designed to meet your group or community's needs.
Start by asking yourself the following:

- Why are you creating a monitoring program?
- What do you want to achieve with this monitoring program?

Make sure you understand what type of water you will be sampling.
Freshwater monitoring can be divided into two categories:
1) Ambient; and 2) Effluent or Impact monitoring.

Ambient: Ambient monitoring focuses on measuring water quality across a broad area to understand their baseline conditions. Ambient monitoring data can be used to track changes in water quality and identify natural trends in a particular aquatic environment.
Sampling considerations:

- What is the purpose of the monitoring?
- Are there any potential sources of natural variation?
- Are there any sources of nonpoint source pollution that could affect water quality?

Effluent/Impact: Impact monitoring provides information about water discharged from potential point or nonpoint sources of pollution, such as wastewater treatment plants or large-scale farming.
Sampling considerations:

- Are there any special permits or legal authorizations linked to the discharge?
- Does the discharge contain any contaminants that could impact the aquatic ecosystem?
- Is there an impact on the water body from the discharge?

There are two types of sampling locations that will need to be considered for effluent monitoring:

- Test site: a location that you have designated as being at risk to a source of pollution.
- Reference site: a location that is relatively unimpacted by a source of pollution. It will provide information about how the water quality in your test sites compare to the best possible conditions.

Goals: Describe the desired outcomes of a water monitoring program.	Objectives: Outline measurable steps for achieving your goal(s).
Outreach and Education (Ambient monitoring)	Pick a few (1-3) sites that you and the community can access easily. Pick sites you can compare and contrast.
Fish Habitat (Ambient monitoring)	Monitor areas that have known temperature fluctuations, anoxic events, high erosion sites, excellent habitat.
Effects of Construction, Development, Highways, Large-scale farming (Effluent/Impact monitoring)	Consult a professional on how best to monitor a problem site.

Monitoring Strategy: A technical plan outlining the who, what, when, how, and where of a monitoring program. To select an appropriate monitoring strategy, be sure to consider the many factors (e.g., seasons, water flow, temperature, etc.) that can affect the body of water you are interested in.

Monitoring programs can be classified into four general categories:

1) Baseline monitoring (ambient): Short term monitoring, mainly used to measure current water quality conditions against accepted guidelines. Baseline monitoring is important for environmental impact assessments because it helps identify problems, and can be used to assess the effectiveness of restoration efforts. Baseline monitoring can help determine whether more rigorous sampling is feasible or desired at a certain location.
2) Trend monitoring (ambient): Trend monitoring takes place over several months or years to identify subtle (or extreme) variations in water quality parameters. Practically speaking, trend monitoring can involve:
    - Measuring one or more parameters at regular time intervals to identify patterns of increases, decreases, and cycles of water conditions over time.
    - Measuring and comparing interdependency (relatedness) between multiple parameters. Be consistent! A lack of consistent monitoring protocols may result in your data not being as representative or accurate as you wish.
3) Compliance monitoring (effluent/impact): Typically done by the government. The main purpose of compliance monitoring is to ensure that polluters comply with environmental regulations and stay within guidelines.
4) Impact assessment monitoring (effluent/impact): Used to assess the impact of point sources of pollution. These types of programs should have test and reference sites. Optimally, a baseline monitoring program should be conducted before pursuing this type of monitoring program. Baseline monitoring establishes the conditions prior to pollution or activity exposure (human-induced or naturally occurring).
    - Compliance and Impact assessment monitoring are typically more long term. If discharge is continually being released into a body of water, monitoring should be maintained.

As a general rule, four samples per year is sufficient for ambient sites. When deciding whether or not to continue monitoring a site, use a strategic approach to determine if the site is adding anything to the story that you want to tell.

We understand water quality day is fun for the staff, however, look at maximizing your staff for the short season they are on. Mileage, staff hours, maintenance and calibration of a field meter can add up to more than the cost of lab samples. Collect both a lab sample and field sample with the YSI to determine agreement between the two. You should only need to collect YSI three more times that season, at that location, if the lab samples are comparable to your YSI readings.

Salt water can contaminate field probes that measure certain parameters such as nitrate. The salt water leads to ion interference of the probe. Extreme caution should be used when using field probes (such as the YSI) at sites near the head of tide. Even a small amount of salt water can cause inaccurate readings for up to 48 hours after the probe is exposed to salt water.

Please note it is important to keep equipment clean to prevent contamination of samples. The following may contaminate your sample: Dust, exhaust, smoke, food, ect.

Use this chart to help design a water monitoring strategy for your group	
Key considerations	Details
Project Details	Project name Watershed name Stream name
Study Area Information	Stream order Geology Approximate elevation Surrounding land use
Sources of Pollution	Human-induced Natural variation
Other Governmental and Non-Governmental Bodies in the area	Government: Municipal, Provincial, Federal Non-Government: Stewardship groups, Research institutes, First Nations (Mi'kmaq)
Data	Existing data collectors (including polluters) Availability of baseline information Data gaps Data entry and management infrastructure (e.g., apps, databases/repositories) Data standards / protocols

Canadian Council of Ministers of the Environment freshwater guidelines for the protection of aquatic life
DO: DISSOLVED OXYGEN should range between 6.5mg/L to 9.5 mg/L (approx. 80% - 120%) SPC: No guidelines have been developed for SPECIFIC CONDUCTIVITY, though higher conductivity and salinity levels can help determine whether a site is influenced by salt water TDS: No guidelines have been developed for TOTAL DISSOLVED SOLIDS in surface water SAL: No guidelines for SALINITY, though values rarely exceed 0.5 ppt in fresh water pH: pH should range between 6.5 to 8.5 NO3: The maximum concentration of NITRATE is 13 mg/L

Resource: Atlantic Water Network's Wet-Pro online course wet-pro.ca
Completion of the "Water Quality Fundamentals" course is strongly recommended!
Other Resources:

- CCME Water Guidelines for Aquatic Life

- CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design
- Canada-wide Framework for Water Quality Monitoring
- Manual for Water Quality Monitoring Sampling in Newfoundland and Labrador
- British Columbia Community-based Water Monitoring: Start Up Guide
- PEI Water Registry