Water Quality Monitoring 2023

This document includes all the information you will need to help in the Muskoka Lakes Association 2017 Water Quality Monitoring program.

Muskoka Lakes Association
FOR ALL GENERATIONS

Team Leader Manual

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1. The MLA

The Muskoka Lakes Association's mission is to promote the responsible use, enjoyment and conservation of the unique Muskoka environment.

Our efforts are concentrated in four areas:

1. **We protect and promote water quality** – The MLA operates the most comprehensive citizen science water monitoring program of any lake association in Canada. Known as the Water Quality Initiative, this program focuses on the near shore, where members access water near their residences. The MLA shares this data with district and municipal governments, and when issues arise, works with a variety of stakeholders to find solutions.

2. **We advocate for responsible government and fair taxation** – The MLA believes fair waterfront taxation depends on responsible, efficient spending by district, municipal and provincial governments.

3. **We promote responsible land use** – The MLA advocates for strong environmental standards and smart, forward-thinking land use and development planning that respects the unique character of Muskoka's communities.

4. **We lead on important Muskoka issues** – The MLA participates in the efforts of Muskoka's district and municipal governments, reporting back to members and taking action on issues that affect waterfront property owners.

The fun side of cottaging

Serious issues are important, but let's face it: a trip to the cottage is all about having fun with family and friends. That's why the MLA supports, funds or operates a variety of cottage-focused events, including an annual aquatic regatta, sailing regattas, biennial boat show, bonspiel and seedling day. We also produce an annual, high quality yearbook, and keep our members up-to-date on Muskoka happenings with a regular newsletter.

To learn more about the Muskoka Lakes Association and the efforts of its committees, please go to www.mla.on.ca

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2. Introduction

Most importantly, thank-you for becoming a Team Leader! We appreciate your help and that of your volunteer team, and recognize that this program would not be possible without you!

This Team Leader Field Manual is a step-by-step guide for Team Leaders to:

a. assist their volunteer teams in the collection of biological, chemical and physical water quality data;
b. analyze some of the samples and submit the results of this analysis; and
c. ensure that the samples for phosphorus and DOC are transported to the Port Carling office of the MLA by 10 a.m. on the Wednesday of the week of testing. These samples will be couriered to the lab for analysis on Wednesday or Thursday of the same week.

This manual is a companion to the equipment kit contained in your large blue plastic tote.

The manual includes:

a. schedule;
b. maps and photos of your sites;
c. a protocol for handling (including in some cases, analyzing) each type of samples your volunteer team collects.

As Team Leader, your first responsibility is to support your volunteer team. You should be familiar with all of the sampling procedures and be able to answer simple questions about the sampling. At the beginning of the summer, make sure that at least one trained volunteer has committed to collecting the sample for each sample date. Your volunteers may appreciate it if you give them a quick call the day before the sample needs to be collected to see if they have any questions.

Under no circumstances are team leaders to alter the monitoring schedule.

Sites are chosen as part of an on-going, long-term effort to monitor at risk areas of the lakes. As such, the sites to be sampled and tested are determined before the beginning of the season. New sites will not be added arbitrarily by the team leader or any other member of the volunteer team without permission of the MLA Water Quality Committee. Moreover, once the sites have been chosen, they are not to be discontinued or switched during the sampling season. Changes to the site samplings will adversely affect long term data trends. Requests for changes should be made in the fall to the MLA for consideration in the following year's program.

If your volunteer team is to collect bacteria samples, you will also be responsible for analyzing these samples. You will find a number of pieces of equipment in your equipment kit that will allow you to follow the specialized protocols for performing the analysis. The bacteria sample analysis is a simple and rewarding exercise. By doing the analysis, you will be able to see firsthand where the bacteria are living and gain a better understanding of how the lake's ecosystem works.

Remember that we collect bacteria data to understand ecosystem health, not to determine if the lake is safe for swimming. Throughout the summer, you may find samples with high *E.Coli* – this is naturally occurring and doesn't necessarily mean that the area is unsafe. Sampling for public health (i.e. to assess safety of swimming waters) uses complex sampling protocols, and our program is not designed to evaluate the safety of the lake. If you do see high readings, do not be alarmed. **Occasional high readings are common and to be expected**. Feel free to call the MLA office, ask questions and share with us your concerns, but please do not be alarmist and spread the word that a certain site had a high reading.

You are our main point of contact with your volunteer team. Please feel free to contact us at any time with questions or concerns.

There will be a lockbox beside the door of the MLA office to allow access anytime to the fridge, which will be on the lower level, where the phosphorous, DOC & calcium samples can be dropped off. The lockbox is provided so that team leaders may drop their samples off during times when the MLA office itself is not open. This will ensure that all team leaders have ample opportunity to drop their samples off before Wednesday at 10:00 am. The code for the lockbox will be provided to you separately. You may rotate the delivery duties to members of your team.

When dropping off samples its a good practice to also drop off the original data sheet at the same time.

3. Legal & Safety

While you are collecting samples, please be safe and make sure your volunteer team is safe! Remember these points:

- Always sample in a team of at least two for safety
- Always wear a life jacket or PFD when you are in the boat
- Watch for people swimming and playing in the water as you approach shore

Pleasure Craft Operators Card requirements

If you operate a boat you must have a Pleasure Craft Operator Card.

The Office of Boating Safety (Transport Canada) recommends that all boaters take a boating safety course. Having more knowledgeable boaters on our waterways will contribute to reducing the number of injuries and incidents and will save lives.

Required safety equipment

For more information please visit www.tc.gc.ca/BoatingSafety

There are safety equipment requirements that apply to all pleasure craft. Volunteers use a number of different types of boats to collect samples. Don't forget to check your safety equipment regularly – especially after taking your boat out of winter storage.

Refer to the boating safety manual before heading out on the water each and every time.

License

Please ensure that your boat is licensed and registered properly. You must have a valid Hull Identification Number, Compliance Notice and License number. For more information see Transport Canada's Office of Boating Safety website at: www.tc.gc.ca/BoatingSafety.

4. Equipment

Provided:

- 1 Team Leader Manual
- 1 plastic bin

Waterproof Sharpie pen for marking phosphorus samples and filling out the data sheet 	Bacteria glass jars corresponding to the number of sites to be sampled (if applicable) 	Phosphorus bottles corresponding to the number of sites to be sampled (if applicable) 	Large collection plastic bottle including fasteners (zip ties) 
Filter 	DOC bottles (if applicable) 	Secchi disc with clip and rubber ties 	Wax pencil to mark bacteria jars (if applicable) 
Incubator (if applicable) 	Coli Plates corresponding to number of sites in your area (one for each sample plus control blanks) 	1 Ultraviolet lamp (if applicable) 	3 bottles of Aquafina water for bacteria blanks (if applicable) 

You must provide:

- An indoor place to plug in the incubator for an undisturbed 24-hour period (plus warm up time).
- A refrigerated space to store phosphorous samples prior to drop off at the MLA office.
- A cooler with ice to keep all samples cold during transportation.

5. Roles and Responsibilities

To be eligible as volunteers, you must attend a training session before each sampling season (usually in early-mid May). Although you may have attended such training sessions in past years, attendance each year is necessary in order to ensure that any changes to protocols or instructions are communicated early and clearly. This eliminates the potential for confusion or miscommunication as the sampling season gets underway. If there is no team leader available from a particular area to attend a training session, there will be no testing done for that area.

As a Team Leader, you are a representative of the Muskoka Lakes Association or your Affiliate Association. You are participating in the WQI without remuneration as part of a volunteer team.

Your responsibilities are to:

- Coordinate your team's sampling schedule (within date guidelines);
- Collect samples from volunteers after they have been collected;
- Prepare the bacteria samples for analysis within 24 hours of them being dropped off;
- Analyze the bacteria samples between 24 and 27 hours after they have been prepared;
- Record the results of the bacteria analysis on the same data sheet used to record sample conditions, and submit all relevant information online. The website to be used will be emailed to you as a link;
- Submit the original data sheets as soon as possible and by the end of the season at the latest;
- Rinse Coli Plates after they have been used and return them to the MLA office during the sampling season or by the end of the season at the latest; and
- Store phosphorus and DOC samples in a refrigerated space until you or a team member delivers them to the MLA office.

6. Preparing and Analyzing Your Samples

There are a few important points that everyone needs to remember when taking samples.

- Refer to the schedule and mark on your personal calendar which dates you are required to sample.
- Communicate with your volunteer team members.
    a. Please meet with your volunteer team and decide who will be collecting the samples on each of the sample dates.
    b. Make sure that all sample dates are accounted for.
    c. Pencil in the names of the volunteer responsible for each date on your schedule.
- Be familiar with the details of the MLA Water Quality program so that you can explain it to others as they may be nervous if they see you poking around the end of their dock.
- Refer any questions you can't answer to the MLA office (705-765-5723).
- **All samples must be kept on ice** and in the dark during sampling and transit to the MLA office (a regular cooler works great).

For Each Sample Period

There are six main components of the team leaders' responsibilities for each sample period:

1. Support your team in their sample collection.
2. Store the phosphorus & DOC samples (if applicable).
3. Prepare the collected bacteria samples for analysis (if applicable).
4. Analyze the samples (if applicable).
5. Submit the data (to web address or via fax or in person).
6. Deliver the phosphorous and DOC samples to the MLA office (if your team collects them). You can also deliver any data sheets or used Coli Plates to the office at the same time. Please ensure you sign in any samples on the sign in sheet above the fridge at the MLA office. This is an important tool for tracking purposes.

1. Support your team

Make sure that someone from your volunteer team is going to be collecting the sample. Discuss this with your team – some might find it helpful if you give them a reminder telephone call the evening before they are to collect their samples.

Each volunteer will have received three (3) bacteria bottles for each site where bacteria is being tested. Please label the bottles (and lids) with the site code with the Wax Pencil. **DO NOT** use a marker or the sharpie pen as these are permanent. Bottles should be stored with the lids off.

Decide what time the samples should be collected. Since you are doing the analysis, your timetable is flexible. Samples can be taken any time on Friday, Saturday, Sunday or Monday on sample weekends. Remember that as team leader, you will have about an hour's work right after the sample collection to prepare the incubator, and another hour's work about 26 hours later to analyze the results. Arrange a time with your team that is convenient for both you and the samplers. Coordinate schedules with your volunteers so that bacteria samples are delivered and incubated as soon as possible after they are collected (no more than 24 hours). You (or a designate) will also need to take the time to deliver any phosphorous and DOC samples to the MLA office.

You should be able to answer simple questions about the collection protocols. If there are questions you can't answer, contact the MLA office (705-765-5723).

Once your volunteer team drops off the samples they have collected to you, keep them on ice in a cooler or in your refrigerator until they are prepared.

2. Phosphorus & DOC Samples

1. You do not analyze the phosphorus or DOC samples; keep these in a small box in a refrigerated space and transport to the fridge in the MLA office in Port Carling prior to 10 am on Wednesday. If this is not possible, please inform the MLA office (705-765-5723) as soon as possible.

2. Please ensure all phosphorus and DOC samples are correctly labeled using the Waterproof Sharpie provided with site code and sample taken date before dropping off at the MLA office.

3. Prepare the bacteria samples

Remember for each sampling, bacteria blanks must be done and the results must be recorded on your data sheet (see below).

1. Plug in the incubator and allow it to warm to 37˚C (adjust temperature with thermostat and thermometer – once set; it should not need to be adjusted again). This could take up to 24 hours.
2. Take 1 Coli Plate for each sample out of one of the Ziploc bags. (Do not remove the lid).
3. Label each Coli Plate to correspond with one of the bacteria sample bottles site codes.
4. Remove the lid from one of the bacteria samples.
5. Remove the lid from the corresponding Coli Plate.
6. Gently pour a small stream of water onto the plate, running the stream along each row of wells.
7. When all wells are full and excess sample water remains on the plate, gently tap the side of the Coli Plate to dislodge any air bubbles which may remain in the bottom of some wells.
8. To ensure that all wells are full, view the plate in a manner where light is reflected off the surface of the wells to your eye. Top up any wells which are not full.
9. To remove excess water from the top of the plate, tilt the plate on a slight angle to one of the plate corners and drain off.
10. Use a paper towel or tissue to wipe away the last few drops of water at the low corner of the plate.
11. Viewing the surface of the plate in reflected light should now reveal that all wells are full, that the surface water on each well has a slight concave shape, and that no excess water remains on the surface of the plate.
12. Replace lid on Coli Plate and place it in the incubator.
13. Empty sample bottle of any remaining sample water.
14. Rinse sample bottle and cap with pure water.
15. Store empty bottles until the end of the season with ids off.
16. Repeat (4) to (15) for each sample collected.

You have a bottle of distilled water in your kit… You will need to prepare what is called a "blank" sample using the water. This sample will be analyzed for bacteria. Since there are no bacteria in distilled water, any contamination of the sample will tell us that the procedures are flawed. This sample should be treated as if it were lake water.

Should you analyze for more than one site or area, you need to only do one blank in total for the sampling week. You do not need to do a blank per area.

Procedure:

1. Pour the water directly from the new bottle of distilled water bottle into the Coli Plate which you have marked ‘blank’.
2. Follow incubating procedures as outlined below.
3. Follow analysis instructions as per below. However, on your data entry sheet mark the blank with your area code followed by ‘X’ (i.e. LAK-X).
4. Make sure to enter your blank results on the data sheet as well as online when you enter your regular results.

For more detailed instructions, please see:
http://bluewaterbiosciences.com/index.php?main_page=product_info&cPath=&products_id=1&zenid=tnbh6428ru4u92p4v6o04e0k34

Allow the samples to incubate for approximately 26 hours (minimum 24 hours, maximum 27 hours). Do not open or disturb incubator during this time, maintaining 37°C.

4. Analysis of samples

1. Remove lid from incubator.
2. Remove lid from Coli Plate (noting the sample number) and count number of blue[1] wells. To make this easier, place the Coli Plate on a white backdrop (such as a sheet of paper on the tabletop) and view in bright light. There is a tally sheet included in your binder to help with this if you find it useful, but it is not mandatory. If you choose to use the tally sheet, please return it with your original data sheet and write the site code.
3. On the current data sheet, record the number of blue wells in the “Blue” column of the row that corresponds to the sample number.
4. Place the Coli Plate on a black or dark surface and turn out the lights (or darken your area as appropriate).
5. Turn on the UV lamp (avoid shining the lamp in your eyes) and shine it on the sample; count the number of blue wells that also fluoresce under the light. (Take care to avoid counting fluorescent wells that were not blue – on some rare occasions, a clear well will fluoresce due to the presence of a species of algae.) If you are unsure whether a well you are looking at is fluorescent, refer to the example sheet provided
6. On the data sheet, record the number of fluorescent wells in the “Blue & Flor.” Column in the row that corresponds to the sample number. **If your “Blue & Flor” count is 18 or greater, please contact the MLA office.** This is not a cause for concern; we are just tracking these readings.
7. Empty the Coli Plate (turn upside down and shake) into a drain (not in the lake). Rinse the plate and place it in a box or bag to be returned to the MLA office as once they are cleaned and retreated they can be re-used.
8. Repeat (2) to (7) for each sample, making sure all results are recorded.

For more information about using Coli Plates, please see:
http://bluewaterbiosciences.com/index.php?main_page=product_info&cPath=&products_id=1&zenid=tnbh6428ru4u92p4v6o04e0k34

[1] Any colouring that appears blue or green should be counted. Do not count yellow, brown or white wells.

5. Submission of Data:

The data that you record must be submitted to the MLA for synthesis and further analysis.

You may submit your results as follows:

- Online at website (link to be provided via email);
- In person, drop them off at the MLA office with phosphorus, DOC and/or calcium samples;
- By fax (705-765-3203); or
- By mail (Box 298, Port Carling, ON, P0B 1J0)

If you use the web link or fax, the **original copy** of each data sheet must also be submitted in person or by mail.

If you have any questions about the interpretation of your results, please contact the MLA Office.

7. Glossary

Affiliate
Is a neighbouring community group representing stakeholders of a lake, lakes or part of a lake apart from those that would otherwise be subject to the delivery of WQI, engaged for the period of this Agreement by the MLA for the purpose of delivering WQI on the lake, lakes or part of a lake for which the group represents stakeholders.

Escherichia Coli
An emerging enterotoxigenic coliform spread by fecal contamination of animal or human origin to food and water (Madigan et al, 2000). *E.Coli* is typically used as an indicator of fecal contamination. The O157:H7 strain is the only strain of *E.Coli* that is itself harmful to humans. Unpredictable numbers of organisms indicate contamination.

Eutrophication
Is the process by which lakes gradually age and become more biologically productive. Eutrophication normally takes thousands of years to progress. However, humans have greatly accelerated this process in thousands of lakes around the globe. More details at http://www.umanitoba.ca/institutes/fisheries/eutro.html
(University of Manitoba, 2002)

Indicator Organisms
Organism used to represent all human enteric pathogens, due to its ease of detection, and its ability to conservatively estimate the presence of pathogens. Total coliforms, including E.Coli, are most often used (Henry and Heinke, 1996).

Leader
Is a volunteer who has successfully completed leader training and has the following responsibilities on all sample dates during the sampling period:
a. Ensuring responsibilities of volunteer team are fulfilled;
b. Analyzing bacteria samples according to protocols and practices demonstrated in leader training and outlined in this manual;
c. Completing data entry as required on data sheets and online; and
d. Delivery of phosphorous samples to MLA office before 10 a.m. on Wednesday of sampling week

Parameters
Each measurement of water quality is called a parameter. The parameters used in the WQI are total Coliform, *E.Coli*, total phosphorus, turbidity and temperature.

Phosphorus
Phosphorus is a component of DNA and RNA and essential element for all living cells. Phosphorus is usually the limiting nutrient in Canadian Shield aquatic ecosystems, which means that adding phosphorus to such an ecosystem results in increased plant growth. Human-based phosphorus sources greatly speed up the process of eutrophication. The most important commercial use of phosphorus- based chemicals is the production of fertilizers.

Sample Date
Means the period of time during which a single iteration of the sampling protocols and associated analysis takes place (typically beginning Monday morning and finishing Tuesday afternoon).

Sampling Area
Is a geographic location named in supporting documentation and encompassing a group of sites.

Sampling Period
Is the period of time between May and September during which four (4) sample dates for each site will be scheduled.

Secchi Depth
Secchi depth is a parameter used to determine the clarity of surface waters. The measurement is made with a “secchi” disc, a black and white disc that is lowered into the water and the depth is recorded at which it is no longer visible.

Site
The discrete and unique location as identified in supporting documentation where samples are to be collected on each sample date.

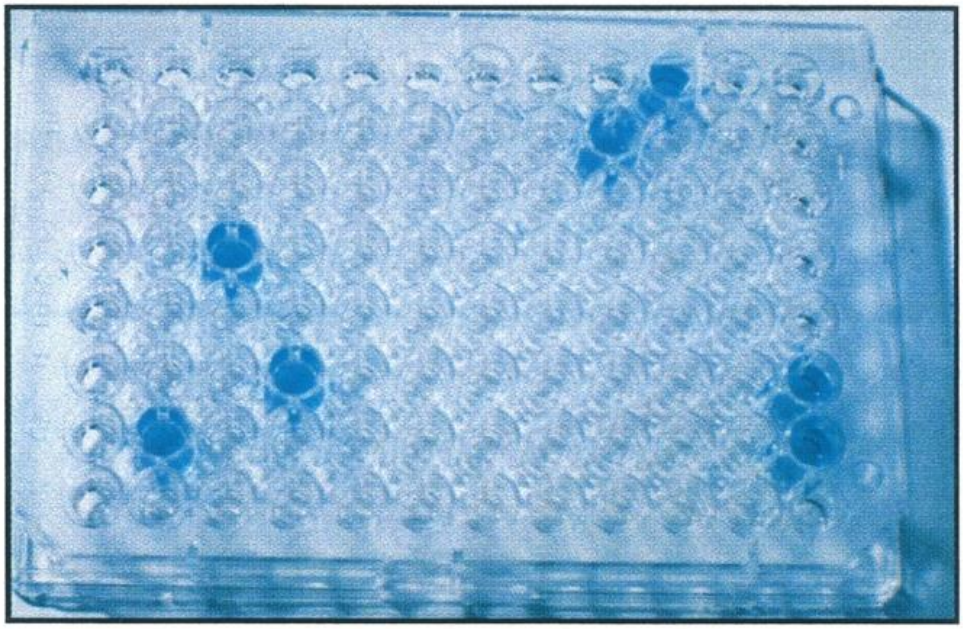
Total Coliform
All aerobic and facultative anaerobic, gram-negative, non-spore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35 degrees Celsius (APHA et al, 1985). Unpredictable numbers of organisms indicate contamination.

Turbidity
Turbidity is a cloudiness or haziness of water (or other fluid) caused by individual particles (suspended solids) that are generally invisible to the naked eye, thus being much like smoke in air. Turbidity is generally caused by phytoplankton. Measurement of turbidity is a key test of water quality.

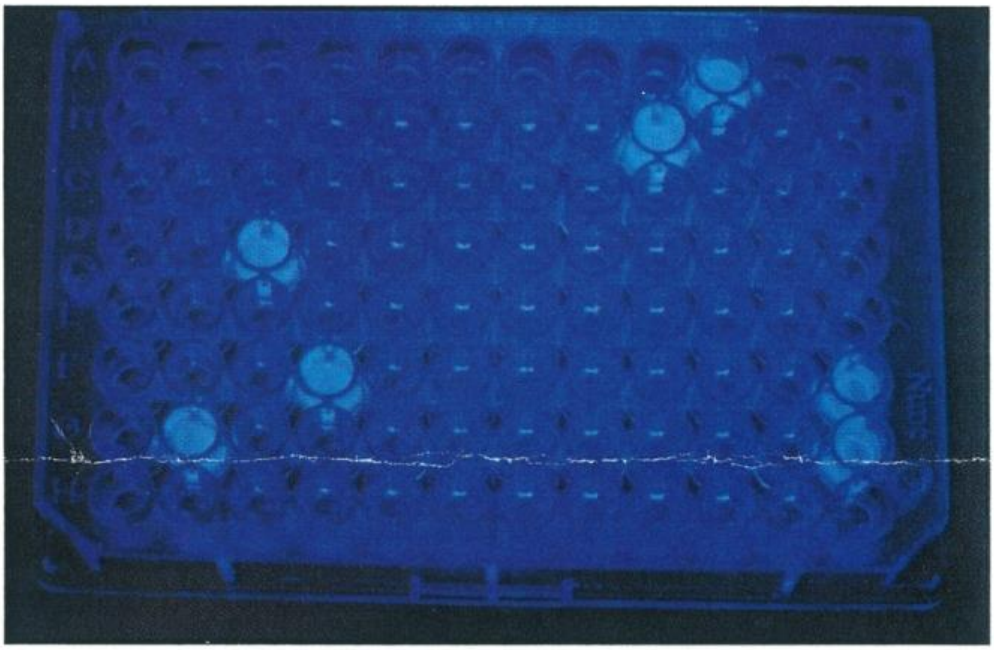
Volunteer
Is an agent of the MLA or Affiliate who successfully completes volunteer training and participates without remuneration in WQI as part of a volunteer team.

Volunteer Team
Is a group of volunteers that may include a leader who are collectively responsible for the collection of samples and recording of water temperature and metadata at all sites within a designated sampling area according to WQI protocols and procedures demonstrated in volunteer training and addressed in supporting documentation thereto; at least one trained volunteer must participate on the volunteer team on each sample date during the sampling period.

Examples of Coli Plate reactions



Blue colour indicative of coliforms



Fluorescence indicative of *E. coli*

Temperature Conversion Chart

˚F	˚C
14	-10.0
15	-9.4
16	-8.9
17	-8.3
18	-7.8
19	-7.2
20	-6.7
21	-6.1
22	-5.6
23	-5.0
24	-4.4
25	-3.9
26	-3.3
27	-2.8
28	-2.2
29	-1.7
30	-1.1
31	-0.6
32	0.0
33	0.6
34	1.1
35	1.7
36	2.2
37	2.8
38	3.3
39	3.9
40	4.4
41	5.0
42	5.6
43	6.1

˚F	˚C
44	6.7
45	7.2
46	7.8
47	8.3
48	8.9
49	9.4
50	10.0
51	10.6
52	11.1
53	11.7
54	12.2
55	12.8
56	13.3
57	13.9
58	14.4
59	15.0
60	15.6
61	16.1
62	16.7
63	17.2
64	17.8
65	18.3
66	18.9
67	19.4
68	20.0
69	20.6
70	21.1
71	21.7
72	22.2
73	22.8

˚F	˚C
74	23.3
75	23.9
76	24.4
77	25.0
78	25.6
79	26.1
80	26.7
81	27.2
82	27.8
83	28.3
84	28.9
85	29.4
86	30.0
87	30.6
88	31.1
89	31.7
90	32.2
91	32.8
92	33.3
93	33.9
94	34.4
95	35.0
96	35.6
97	36.1
98	36.7
99	37.2
100	37.8
101	38.3
102	38.9
103	39.4

Sample Data Sheet

MLA™
Muskoka Lakes Association
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Sample Area: LAK—Lake Name

Date	July 1, 2011	**Sample Time**	2:00 pm
Trained Sampler	John Doe	**Other Volunteers**	Jen Doe & Tom Smith
Rainfall in last 24 hours (heavy, moderate, light, none)	heavy	**Air Temp.**	16°C

Site Specific Information *Please note that all measurements taken should be in metric*

Site Code	Water Temp.	Waves	Secchi Down	Secchi Up	Blue	Blue & Flor.
LAK-0	19°C	☐ Calm ☑ Rough	1.7 m	2 m	N/A	N/A
LAK-1	20°C	☑ Calm ☐ Rough	N/A	N/A	12	8
LAK-2	22°C	☑ Calm ☐ Rough	N/A	N/A	3	0
LAK-3	21°C	☑ Calm ☐ Rough	N/A	N/A	5	2
LAK-4	19°C	☑ Calm ☐ Rough	N/A	N/A	24	16
		☐ Calm ☐ Rough				
		☐ Calm ☐ Rough				
		☐ Calm ☐ Rough				
		☐ Calm ☐ Rough				

For Team Leader Use:

Preparation Date/Time: July 2 @ 8am
Analysis Date/Time: July 3 @ 11am
Analysis done by: John Doe

Comments:

Large flock of Canada geese sighted at LAK-4

Notes