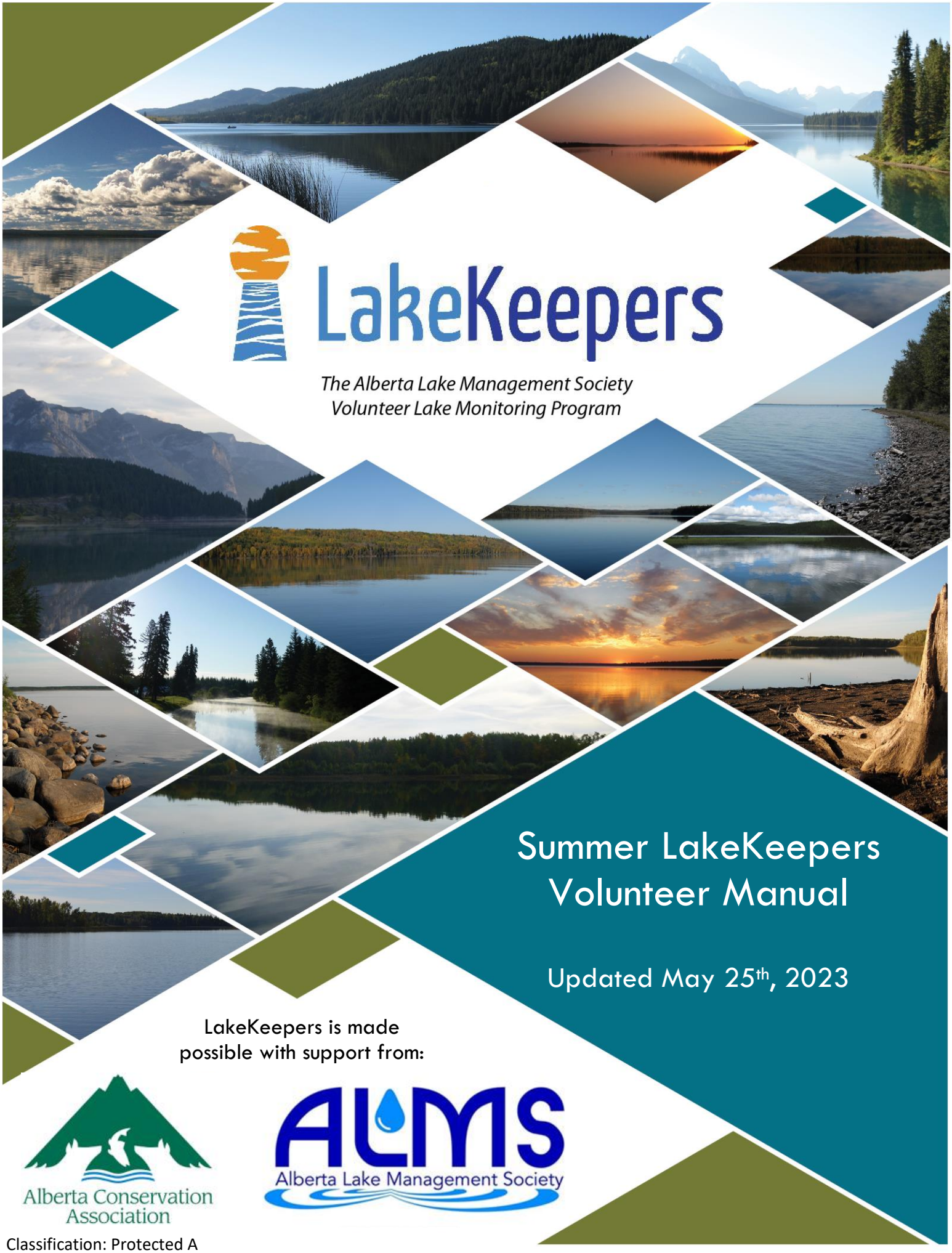


LakeKeepers

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

Summer LakeKeepers Volunteer Manual

Updated May 25th, 2023

LakeKeepers is made possible with support from:

Alberta Conservation Association

ALMS Alberta Lake Management Society

ALBERTA LAKE MANAGEMENT SOCIETY'S LAKEKEEPERS PROGRAM

Welcome to LakeKeepers!

Thank you for expressing an interest in Alberta's aquatic environments and for participating in the LakeKeepers program. You have proven that ecological apathy can be overcome and give us hope that our water resources will not be the limiting factor in the health of our environment. Throughout this process, you will be involved in the collection and preparation of scientific data important to assessing the health of your lake. This manual is meant to supplement hands-on training and communication with ALMS staff throughout the process.

LakeKeepers has several important objectives, one of which is to address gaps in lake water quality data that exist in many remote parts of Alberta. At ALMS, our mission is to promote the understanding and comprehensive management of lakes and reservoirs and their watersheds. With LakeKeepers, we hope to expand the breadth of lake monitoring, education, and management in Alberta.

For field sheets and more, visit:

https://alms.ca/summer-lakekeepers/

(Disclaimer: videos are now out of date, refer to this manual only for most up to date protocol for Summer LakeKeepers 2023)

This manual was last updated in May 2023 by Kurstyn Perrin. For more information, please contact Kurstyn.cappis@alms.ca

What's in my kit?

On the boat	On the shore
1. Manual and field sheet 2. Depth measuring tape and weight 3. Secchi disk 4. YSI probe 5. Cooler & Ice Packs 6. *1 L brown bottle with extra labels 7. Two 250 mL clear bottles for Total Phosphorus (TP) + preservative 8. 125 mL clear bottle for microcystin toxin	a) Chlorophyll-a filtering apparatus (Figure 6): • Buchner funnel • Rubber stopper • Hand pump and tube • Plastic filter flask • Graduated cylinder • Clear squirt bottle • Tweezers • Circular filter paper • Pure water • Gloves • Magnesium Carbonate • Aluminum foil • Petri dishes & filter labels ***Screw-on filter set will not include Buchner funnel, rubber stopper and filter flask – see Figure 7**

When do I sample?

As a Summer LakeKeepers volunteer, you will be sampling your lake on three occasions during the ice-off season: once in June, once in mid-July/mid-August, and once in September. These are called sampling events. You can pick dates that best suit your schedule and the weather. However, sampling dates must be a minimum of 2 weeks apart. It is best to sample during mid-day, as close to noon as possible. Sampling should not take place if unsafe conditions exist or are forecasted on the water body. Sampling must be halted if unsafe conditions arise. Hazards associated with unsafe conditions include extreme temperatures, wind, excessive rain, lightning, etc. It is the responsibility of the participant to ensure they are utilizing appropriate personal protective equipment and that their boat is in proper working order. Participants must read and complete the Volunteer Informed Consent document before sampling.

BEFORE YOU HEAD OUT:

- Make sure your probe is charged.
- Calibrate your probe.
- Complete your online informed consent form at https://alms.ca/summer-lakekeepers/
- Check the weather to make sure conditions are safe for boating, and are likely to remain so.
- Make sure you have a cold ice pack to bring out with the bottle set in the cooler.
- While you're checking the weather, find the 24 hour rainfall accumulation for the area and mark this on your field sheet. It helps us understand the impact of rain on water clarity.

CALIBRATE PROBE AT THE LAKE:

- Calibrate your probe within the hour before sampling:
- Remove the **grey sleeve** (b) from your **probe** (d).
- Remove the **metal probe guard** (a) and gently wipe any water droplets from the probe with a Kimwipe.
- Carefully place the metal guard back over your probe.
- There is a yellow sponge inside the grey calibration sleeve. Using water from the calibration bottle, wet the **yellow sponge** (c) with a little bit of clean water. The sponge should be wet, but not dripping.
- Place the grey sleeve (with yellow sponge inside) over the metal guard.
- Wait five minutes to allow the air in the probe to become saturated with moisture from the sponge.
- Connect your probe to your **handheld unit** (e).
- Press the green power button  on your handheld unit.
- Press Cal 
- Choose ODO or DO by pressing Enter
- Choose DO (dissolved oxygen) % by pressing Enter
- Wait one minute.
- **Record the Barometer on your field sheet.**
- Choose Accept Calibration by pressing Enter.
- Press escape until you see the 'log one sample' screen.
- Keep the probe in its grey sleeve and in the sampling kit until you are ready to collect data.

Figure 1. Probe components

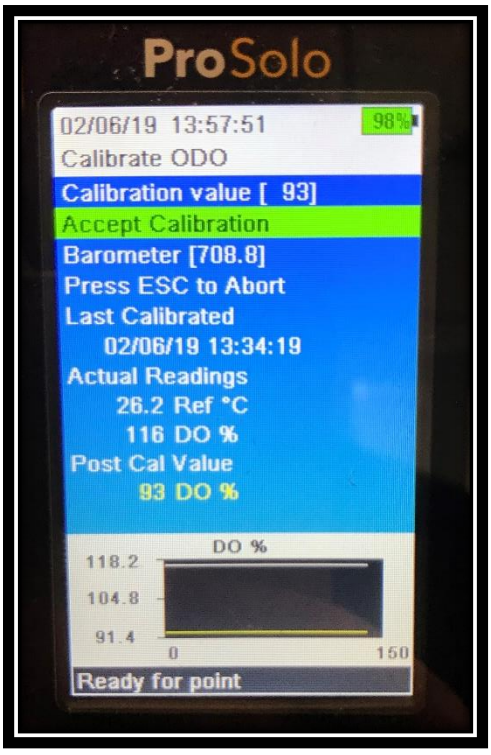


Figure 2. Probe screen while calibrating for ODO (optical dissolved oxygen)

What are we collecting?

1. ***Secchi Depth:***

Water clarity is influenced by suspended materials, both living and dead, as well as dissolved colored compounds in the water column. During the melting of snow and ice in spring, lake water can become turbid (cloudy) from silt transported into the lake. Lake water usually clears in late spring but then becomes more turbid with increased algal growth as the summer progresses. The easiest and most widely used measure of lake water clarity is the Secchi disk depth. Two times the Secchi disk depth equals the euphotic depth – the depth to which there is enough light for photosynthesis.

2. ***Temperature:***

Water temperature in a lake dictates the behavior of many chemical parameters responsible for water quality. We will measure temperature 10cm below the surface, 0.5m below surface, 1m below the surface, and then at 1m increments until 1 meter off the bottom.

3. ***Water Depth:***

Water depth puts the profile readings into context. You may use the tape & weight in the kit to record this depth, or a depth finder if your boat has one.

4. ***Water Chemistry***

a) **Chlorophyll-*a*:** Chlorophyll-*a* is a pigment that algae and cyanobacteria (blue-green algae) use to convert the sun's energy into food (photosynthesis). Chlorophyll-*a* can easily be extracted in the laboratory. Consequently, chlorophyll -*a* is a good estimate of the amount of algae or blue-green algae in the water.

b) **Microcystin:** Microcystin is a group of toxins produced by cyanobacteria (blue-green algae) which, when ingested, can cause liver damage in mammals. Microcystin is produced by many species of cyanobacteria which are common to Alberta's Lakes and are thought to be one of the most common cyanobacteria toxins. In Alberta, recreational guidelines for microcystin are set at 10 µg/L.

c) **Total Phosphorus:** The nutrient phosphorus is important for the growth of algae and cyanobacteria in Alberta lakes. Even a slight increase of phosphorus in a lake can, given the right conditions, promote blooms which turn the water green and may impair recreational activities. Phosphorus may originate from the lake sediments or externally from natural sources, or from pollution such as human waste, animal waste, and fertilizers.

d) **Dissolved oxygen (DO):** The amount of oxygen dissolved in the water is measured in milligrams per litre, as well as percent saturation. As many organisms that live in the water require oxygen for respiration, this can be an important metric to understand the lake's ability to support different types of aquatic life, including fish. In deep lakes, it is normal for oxygen levels to drop rapidly part way through the water column, usually accompanied by a rapid drop in temperature. This is called a thermocline.

On the Boat:

Only use the provided equipment on the lake(s) you have been assigned. Never use your sampling equipment for other waterbodies. This will ensure you do not promote the spread of aquatic invasive species. For safety reasons, sampling should be conducted with at least two individuals.

STEP 1. *Find your sample site*

a) Navigate to the **deepest part of the lake**, preferably in the main basin as marked on your map. Use your depth finder or measuring tape with a weight attached to determine the lake's depth. Ensure your measuring tape is straight up and down when reading the depth. **Record the bottom depth in the 'Bottom Depth' box on your field sheet.** Once you are at the deepest part of the lake, drop your anchor, feeding out anchor line at **least twice as long as the lake is deep.** You will need to feed out more line if it is windy, and during this process you may need to drive a few meters into the wind before **dropping anchor** so that you can drift back on your anchor line and come to rest above the deep spot. This anchoring procedure is important to reduce drifting during sampling. Do not sample if it is too windy to keep your boat from drifting while anchored. If available, use a GPS or a smartphone to mark the deep spot so it can be easily found on your next trip. You may now turn off your boat motor to begin sampling.

b) Record the bottom depth and other observations on your field sheet: Air temperature, wind speed, wind direction, percent cloud cover, and evidence of cyanobacteria blooms. Record your GPS coordinates on the back side of the field sheet.

STEP 2. *Secchi Depth*

e) At the deep spot, take out your **Secchi disk** (Figure 4)

f) On the **shady side** of the boat and with **sunglasses removed**, lower the Secchi disk until it is no longer visible – record this depth on your field sheet. (Note: depending on the angle of the sun, it may be not be possible to locate a shady side of the boat.)

g) Your Secchi disk is marked in increments of 10 cm or 25cm.

h) Note the **colour** of the white part of the disk under water as colourless, brown or green on field sheet.

i) Raise the Secchi disk back up until it is barely visible and record this depth on your field sheet.

j) Find the average of the above two depths and record this as your Secchi disk depth.

STEP 3. *Grab Sample*

a) At the deep spot, you will be collecting water from as deep as you can reach below the surface, about 0.5m. Take out your **1 L brown bottle for Chlorophyll-a, two 250 mL white bottles for Total Phosphorus and one microcystins bottle** (Figure 5). Your 250 mL bottles have a yellow-capped preservative attached to them. Keep aside until step **3e.**

b) **Label these bottles with the sampling date and time (nearest 15 minutes is fine).**

c) After your bottles are labelled, rinse each bottle three times with water from 10 cm below the surface of the lake. Make sure you are rinsing the bottle's cap as well.

d) After rinsing, you are ready to take a grab sample. With the cap off and the bottle upside down, push the bottle below the surface as deep as you can reach, about 0.5m, and to a maximum of 1m. At this depth, let the air out of the bottle until it is full. Bring it back to the surface and place the lids back on the bottle. Do this with all four bottles.

e) Add the yellow-capped preservative to your 250 mL bottles – wear gloves to ensure the preservative does not come into contact with your skin- it is strong sulfuric acid. If you feel more comfortable with adding the preservative on shore, then do so.

STEP 4. *Temperature and Dissolved oxygen profile using YSI probe*

a) With your probe turned on to the 'Log One Sample' screen, lower the probe until the 0.1 m marker is at the surface of the water. ***See Figure 8 for probe marking guide.***

b) If your backlight turns off during sampling, press any key to reactivate it.

c) Record the temperature and dissolved oxygen measurements on your field sheet in the 0.1 m depth row.

d) You may need to wait 30-60 seconds for your dissolved oxygen readings to stabilize at each depth.

e) Continue this process at the 0.5 m mark, and then every meter increment until you have hit the bottom of the lake.

f) Record the bottom depth in the 'Bottom Depth' box on your field sheet, if you haven't already done so.

g) Hold the Power Button to turn off your probe.

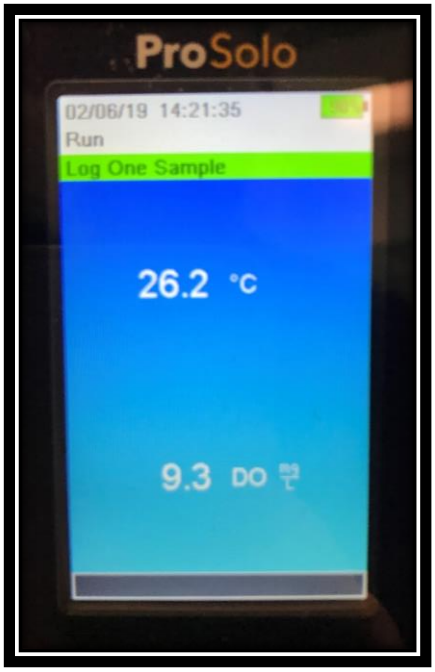


Figure 3. Probe screen while taking measurements

h) Place the grey sleeve with wet sponge inside back over the metal guard. Return the probe to the sampling kit.

STEP 5. *Microcystin Grab Sample*

a) From your deep spot, label the **125 mL clear microcystin bottle with the sampling date and time (nearest 15 minutes is fine).**

b) **Using gloves**, rinse the bottle three times, then collect a grab sample of the bloom at the deep spot OR anywhere else on the lake with the **125 mL clear microcystin bottle.** Cap the bottle tightly, and place the bottle with the others that will be sent back to ALMS.

c) On the field sheet, describe location of microcystin sample (GPS coordinates preferred), as well as general extent of bloom across the lake. If possible, take a picture of the bloom that was sampled, and send to kurstyn.cappis@alms.ca.

On the Shore:

STEP 1. *Filtering chlorophyll*

a) Filtering must be performed away from direct sunlight and on a level surface.

b) Put on your gloves to avoid contamination.

c) Set up the chlorophyll filtering apparatus as shown in Figure 6. Make sure the tubing is connected tightly. You will need the following pieces: plastic filter top, blue rubber stopper, plastic filter flask, hand pump, filter paper, graduated cylinder, pure water poured into your squirt bottle, tweezers, Magnesium carbonate and **1L brown container** filled with lake water**. *Some filter kits will have a different set-up: a screw-on funnel and flask, and no plastic weight or rubber stopper is needed. See in Figure 8 below***

d) Unscrew the filter top and place a filter paper on the surface **covering all the holes**. Make sure the rubber stopper is secure.

e) Wet the filter paper with **pure water**.

f) Use the hand pump to gently increase pressure and allow water to filter through to the flask underneath. Try not to exceed 20 psi on the dial.

g) Shake the **brown container**, measure 20 mL of lake water using the graduated cylinder and pour onto filter paper. **Maintain pressure while pouring lake water onto the filter paper.** Pump until all the water has drained.

h) Repeat step **h** until there is only a SLIGHT green colour visible on the filter paper. This may take up to 100 mL of water, depending on the lake. If you can't tell if the paper is green, pick it up and look at it.

i) Once enough lake water has been filtered, **record the volume of lake water filtered in the 'Filtering Chlorophyll' section on the back side of the field sheet.**

j) Then, rinse the graduated cylinder and inside the filter apparatus 3x with **pure water** onto the filter paper. Pump as you go.

k) If the plastic flask becomes full (or the bottom of the filter apparatus if applicable), remove the rubber stopper, discard the lake water, and continue filtering. **Make sure the plastic or screw-on filter bottom set does not get full enough to reach the pump tubing.**

l) Record the colour of the first filter paper on the backside of the field sheet.

m) Remove the top portion of the filter apparatus now and add three drops of magnesium carbonate onto the filter paper, and pump to drain the liquid through.

n) Using tweezers, fold the filter paper in half twice. Avoid touching any portion of the paper that has chlorophyll.

o) Finally, place the folded filter paper into a petri dish using tweezers. Label the dish with your name, date, lake, and total volume of lake water filtered (using labels provided).

p) Wrap the petri dish in aluminum foil to protect it from light.

q) Place a new filter paper on the apparatus and repeat this procedure **two more times to obtain three filter papers total.**

r) Excess water at the end of filtering can be discarded back into the lake.

SAMPLE STORAGE:

a) Place your two **250 mL bottles** in a Ziploc bag and place in **your fridge.**

b) Place your **three petri dishes AND one 125 mL microcystins bottle** in a Ziploc bag and place in **your freezer.**

SAMPLE SHIPMENT:

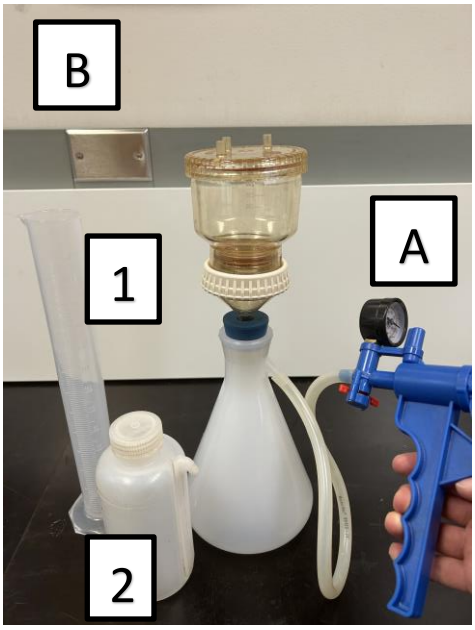
Samples collected with this program must be analyzed within 30 days of collection – this means you will have to send your samples to the Alberta Lake Management Society in Edmonton at 4816 89 St NW. It is important that your samples remain cold and that they are received in a timely fashion**. Also make sure that the petri dishes which house the chlorophyll-a filters remain in a water-proof Ziploc bag when being shipped.** Please also send a copy of the field sheet along with the samples, put the field sheet in a large Ziploc bag to keep the sheet dry. Please refer to the 'Shipping Slip' included in your kit for the Purolator account number you can use and coordinate with ALMS at 780-702-2567 or kurstyn.cappis@alms.ca to arrange for the shipping of samples.

EQUIPMENT CLEANING:

If you are keeping your equipment for the summer and not returning it to the office between each sampling event, your probe, chlorophyll filtering equipment and the brown container should be cleaned between samples will to ensure the integrity of your data. The probe (only the part that goes in the water) and chlorophyll filtering equipment should be rinsed 6 times each with hot water. Avoid placing equipment on unclean surfaces such as the ground or in a sink. Also avoid cleaning your equipment with soaps or detergents; these contain chemicals which will contaminate future samples. Once your equipment has been rinsed, allow it to dry on a clean surface such as paper towel or clean towels before returning it to your field kits.

Figure 4. Secchi disk

Figure 5. Summer LakeKeepers bottle set: 1 L brown Chlorophyll-*a* bottle, two 250 mL clear Total Phosphorus bottles with yellow-capped preservatives, and a 125 mL clear Microcystin bottle



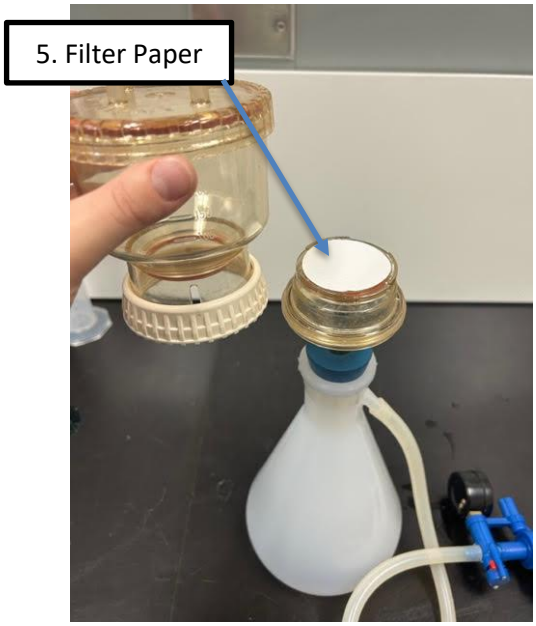


Figure 6. A) Hand pump connected with rubber tubing to B) filtration system including:

1. Graduated cylinder
2. Squirt bottle
3. Filter apparatus
4. 1000 mL flask
5. Filter paper

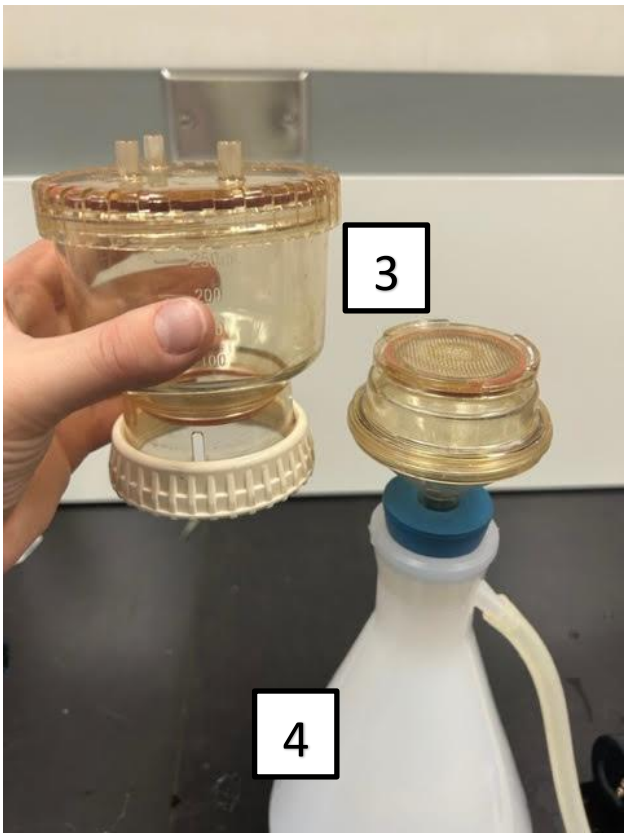


Figure 7. Screw-on filter set

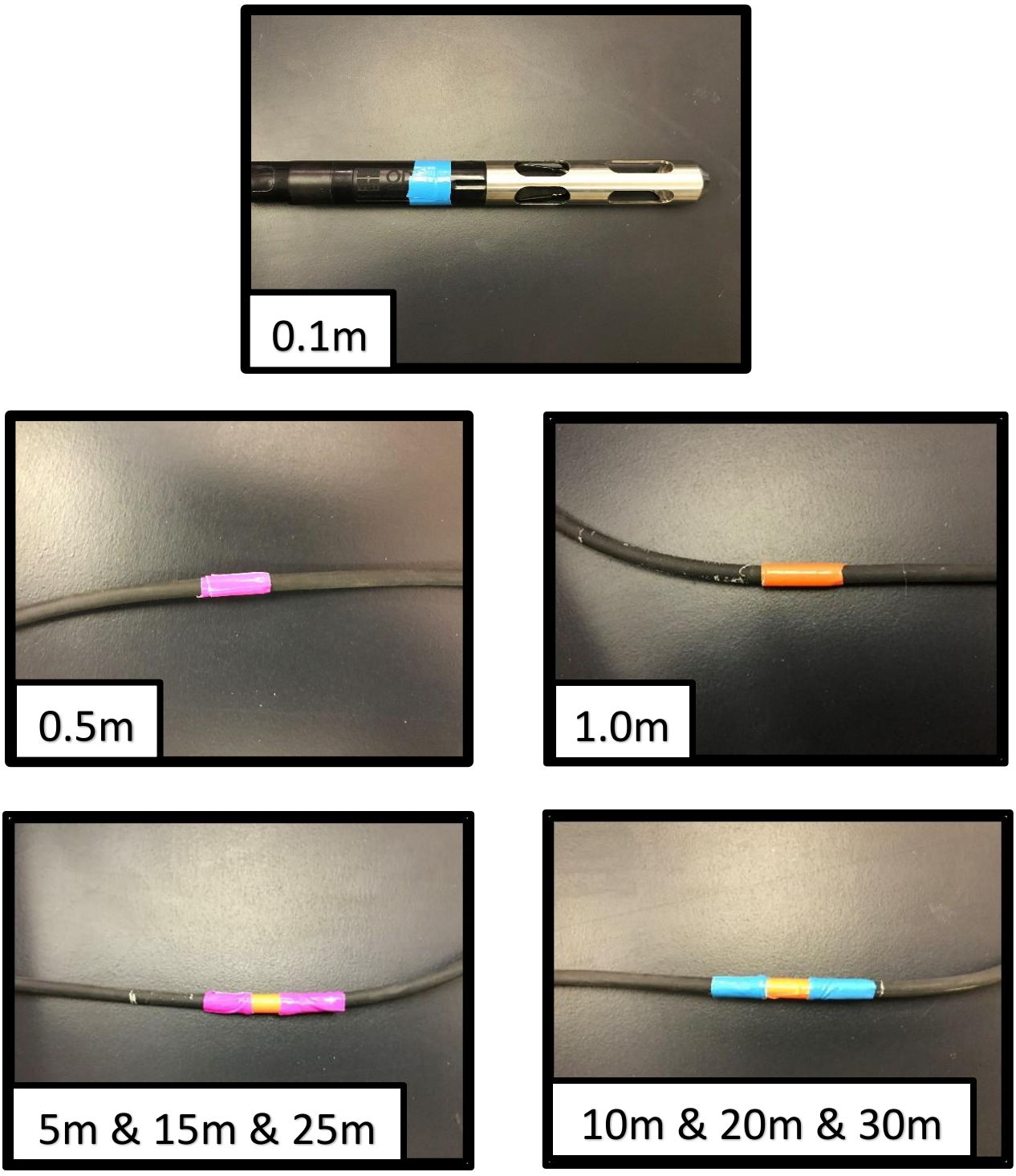


Figure 8. Depth marking guide for YSI Probe