Adirondack Lake Assessment Program Sampling Manual

Contents:

I. Training

- All new ALAP volunteers are required to participate in a training session. In-person training sessions occur at the beginning of May on the campus of Paul Smith's College. If you are a new volunteer and cannot attend a training session, please contact the ALAP coordinator. Return volunteers are welcome to join an in-person training session at any time to refresh their skills.
- Return volunteers should review this manual at the start of this season and watch the sampling protocol video available on the ALAP website: https://www.adklakes.org/sampling-protocol
- We encourage returning volunteers to attend an in-person training session every five years.

II. Sampling Equipment

- New volunteers will receive an initial equipment kit during their training, or it can be mailed
    - The equipment kit includes:
        - 1 liter mixing bottle
        - 2 m integrated tube sampler
        - Secchi disk attached to a measuring tape
        - Chlorophyll filtering apparatus
        - Hand pump and tubing
        - Tweezers
    - It is the responsibility of the volunteer to keep and maintain this equipment for the duration of the lake's enrollment in ALAP. If something gets lost or damaged, please contact the ALAP coordinator to receive a replacement
- All volunteers will be mailed monthly sampling kits for the entire season prior to the start of the sampling season.
    - Monthly sampling kits include:
        - Sample bottles
        - Chlorophyll filter packets
        - Sample Information Sheets
        - A copy of the Sampling Protocol- Quick Guide and Equipment Checklist
- We ask volunteers to provide their own boat, anchor, cooler, and ice.
    - If you do not have an anchor, small mushroom anchors can be found online for ~$20 and are adequate for a canoe or other small watercraft

III. Sampling Schedule

- ALAP lakes are sampled monthly during the summer for either a five-month or a three-month period. Lakes enrolled in the five-month program are sampled from May through September, and lakes in the three-month program are sampled from June through August.
- Every year AWI will schedule a sampling window during each month that we ask our volunteers to sample within. The sampling window is a 10-day period encompassing two weekends near the end of the month. (ie Friday, June 20th – Sunday, June 29th.) You may sample any day during the sampling window. The schedule will be sent out each year along

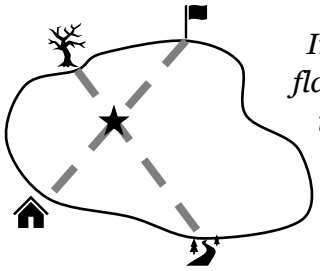
with the sampling kits and can also be found online on the ALAP website: https://www.adklakes.org/sampling-schedule

  - *If you cannot sample during the scheduled sampling window, please contact the ALAP coordinator as soon as you are aware of the conflict. We will work with you to make alternate arrangements.*

- Upon completion of your sampling trip, please deliver the sample to the nearest collection hub by the close of the sampling window. A map and list of collection hub locations can be found on the ALAP website.

IV. Sampling Location

- You will sample your lake at its deepest point. Prior to your inaugural sampling trip, the ALAP coordinator will send you a map of your lake with this point clearly marked along with the GPS coordinates.
- We recommend using a GPS unit or smartphone map function to navigate to the point during your first trip. GPS will still work on a smartphone without cellular service, but you must enter the coordinates of the point when you are connected to the internet or a cellular network. You can then save the point in your map app to find it while offline. If you are unable to do this, you can access the map app and compare your location to the point on the map we have sent.
- We also ask that **you record your GPS coordinates on the sample information sheet**. This allows us to confirm a consistent sampling location. You can find your coordinates in the compass app on your smartphone or with a handheld GPS unit.
- **It is important to return to the same spot every trip**, so once you have picked a spot and set your anchor, both mark the point on your phone or GPS unit and take note of your physical surroundings to orient yourself visually on your lake. This will allow you to have confidence in your sampling location if your technology fails you.
- A good way to do this is to choose two sets of landmarks on shore that you can easily recognize. The landmarks in each set should be across from one another and in line with your boat. You should be in the middle of the imaginary 'X" connecting the four landmarks. We recommend writing them down on your map and taking a picture of each one in case you need to jog your memory. This is particularly important as many Adirondack lakes are completely surrounded by forest, and it can be challenging to distinguish one tree or rock from another.



In this example, the star is the sampling point. On shore, I have found a house and flagpole on opposite shores that are in line with my boat, and a recognizable old dead tree and a boat launch on opposite shores that are also in line with my boat. Next time I return to sample, I can draw a mental line between each set of landmarks and position my boat where the two lines intersect.

V. Lake Sampling

Prior to the scheduled sampling week, we recommend:

A.) Reviewing this manual to make sure you understand the sampling protocol

B.) Looking over your sampling equipment for completeness.

- If you have any questions or cannot locate any of the equipment, contact the ALAP coordinator **ASAP** (518-327-6174, eyerger@paulsmiths.edu). We will be happy to answer any questions and replace any lost items.

Equipment Checklist

(also found on the "Sampling Protocol- Quick Guide and Equipment Checklist, Pg.11")

- Boat
- Anchor
- Life Jackets
- Cooler with Ice
- Sample Info Sheet
- Integrated Tube Sampler
- 1 Liter Mixing Bottle
- Secchi Disk
- Filtering Apparatus
- Hand pump
- Pencil
- Membrane Filter
- Tweezer
- Aluminum Foil
- AWI Sample Bottle
- Permanent marker
- Sampling "quick guide" (pg 11)

Pick a day to do your sampling trip.

- We recommend choosing a calm day with minimal precipitation. This will make the experience more enjoyable for you and result in better data for us.
- Please aim to sample between 9:00 am and 3:00 pm when planning your trip. Secchi transparency measurements are more accurate when the sun is overhead as opposed to low on the horizon.

If, for whatever reason, you are unable to sample during the assigned week, please contact the ALAP coordinator as soon as possible. We will work with you to make alternate arrangements for sample collection and delivery.

ALAP Coordinator: E. Yerger
518-327-6174
eyerger@paulsmiths.edu

On the day of your sampling trip, review the sampling quick guide and equipment list.

- Double check you have all items needed for sampling before heading out, including the quick guide if you need to reference the sampling procedure while out on the lake.
- Check the weather and pack appropriate clothing.

We recommend also taking a copy of this complete manual during your first few trips as you become familiar with the sampling methods.

Travel to the deepest part of the lake and tie off to your buoy or set an anchor.

- Anchoring is important as it ensures your Secchi observations and tube sample collection are not impacted by drifting.
- If you do not have a permanent buoy, double check you are at the correct location on your lake by checking your coordinates on your phone or GPS unit and/or by confirming your sightlines to benchmarks onshore (see "Sampling Location" section in this manual for guidance on navigating to your sampling location).
- Set your anchor and confirm you are not drifting.
    - Pick a landmark and note your position relative to it. After a few minutes have passed, check your relative position to the landmark again.

Observe the weather and record your notes on the Sample information sheet.

- Take note of the sky cover (sunny, partly sunny, overcast, raining, snowing), wind conditions (calm, moderate, windy), water condition (calm, ripple, light chop, white caps, swells, ice), and air temperature (hot, warm, cool, cold). Make any additional observations as you see fit.

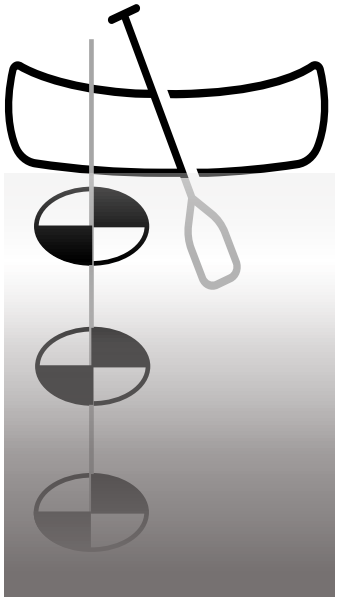
Weather Observations:

Sky Cover:	◯ Sunny	◯ Partly Cloudy	◯ Overcast	◯ Raining	◯ Snowing	
Wind Speed:	◯ Calm	◯ Moderate	◯ Windy			
Water Condition:	◯ Calm	◯ Ripple	◯ Light Chop	◯ White Caps	◯ Swells	◯ Ice
Air Temperature:	◯ Hot	◯ Warm	◯ Cool	◯ Cold		

Measure and record Secchi transparency.

- Take the Secchi transparency measurement from the shady side of the boat, if possible. This reduces the effect of glare on your measurement.
- If you are wearing sunglasses, remove them.

You will take **two** measurements:



1. First, lower the disk slowly through the water column.

- Stop at the point at which the disk disappears from your view.
- Record the depth in m to the closest 10th m. (i.e. 4.2 m.) at the level of the water's surface on your sample information sheet.
- If it is difficult to read the measurement while the tape is in the water, pinch the tape at the surface of the water and raise the tape back into your boat.

2. Next, lower the disk a few more feet (you should not be able to see it) and raise the disk slowly up through the water until it reappears.

- Stop at this point and record the depth on your sample information sheet.

The two measurements will most likely not be the same, but they should be within a meter of each other. If you are unsure of your results, repeat both measurements.

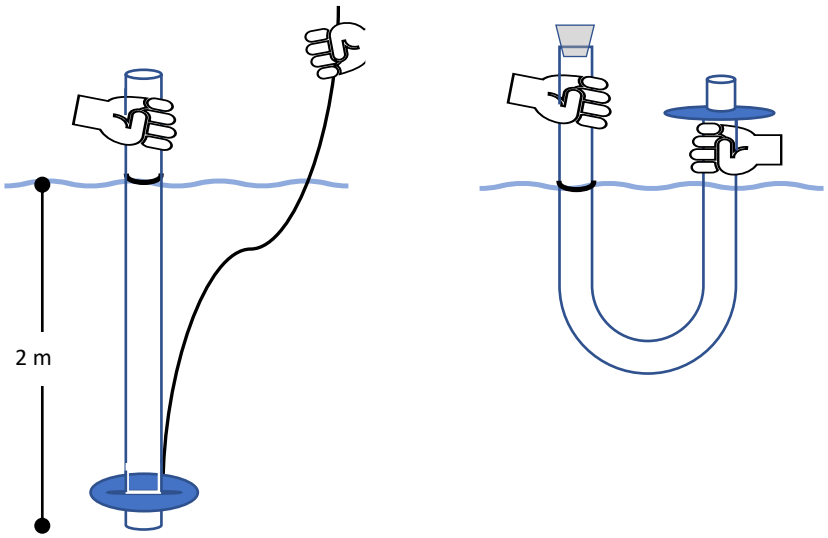
* If your Secchi disk hits the bottom of the lake before it disappears from view, mark this on your sample information sheet by checking the box that says "Is the Secchi disk visible and touching to bottom of the lake?" Record the depth on the line underneath.

Make two Secchi disk observations from the shady side of the boat *without using sunglasses*.

Secchi Depth Observation 1:		◯ Feet	**OR**	**Is the Secchi disk visible and touching the bottom of the lake?** ◯ Yes ◯ No
Secchi Depth Observation 2:		◯ Meters		**Secchi Depth:** _____

Collect a sample of lake surface water.

- If possible, collect your water sample from the opposite side of the boat from where you lowered your Secchi disk.
- Prior to collecting your sample, rinse the sampling equipment (tube sampler, 1 liter mixing bottle including cap, AWI sample bottle including cap) three times with surface lake water. Take care not to touch the inside of the lids or bottle while rinsing.
  Lake water samples are easily contaminated by human hands, sunblock, bug spray, etc.!



1.) While holding on to the end of the attached string and the top of the tube, lower the weighted end of the integrated tube sampler down into the water until the black mark near the top of the tube is level with the water's surface.

2.) Place the cork stopper securely into the top of the tube sampler. This will trap the water inside the tube as you use the string to raise the weighted end out of the water, keeping the black line as close to the water's surface as possible.

3.) Lift the entire sampling tube out of the water and empty the contents into the 1 liter mixing bottle by positioning the weighted end over the bottle's opening and uncorking, and raising the top end. Cap and invert a few times to mix contents. The full contents of the tube sampler should come close to filling the 1 liter mixing bottle. If it does not, you will not have enough water. Discard what you have collected and resample to collect a complete 2m integrated sample.

- This water will be used to fill the AWI sample bottle and to filter for a chlorophyll sample. You can do these steps immediately while on your boat or after arriving back on shore (I.e. in the case of rough weather or rain.)

- If you choose to wait until you reach shore, immediately place the 1 liter bottle containing your sample inside a cooler with an ice pack. This will help preserve the integrity of the sample during your trip back to shore.

Collect a chlorophyll sample

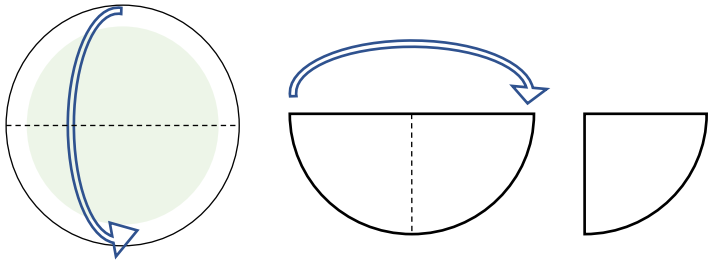
We are interested in capturing algae particles in the water. You will pump a known quantity of water (250 mLs) through a filter membrane, which will capture the particles while allowing the water to pass through.

- For this step, you will need:
  - **chlorophyll filter packet** (plastic bag with aluminum foil and filter,)
  - **filtering apparatus**,
  - **hand pump**
  - a pair of **tweezers**.
- Chlorophyll is light sensitive, so if possible, try to shield the sample from sunlight while filtering (i.e. by filtering in your own shadow.) This is not always feasible while in an anchored canoe.
- If it is windy, you might consider filtering whence back onshore, as the wind has a way of whisking away weakly grasped filters.

1. Remove the top funnel unit of the filtering apparatus and double-check a rubber o-ring is in place.
2. Using the tweezers, remove the filter from the plastic bag and place it in the centerpiece of the bottom unit. Take care not to rip or puncture the filter. It's helpful to add a few drops of lake water to wet the centerpiece before setting the filter paper on it.
3. Once the filter is in place, attach the top funnel unit of the filtering apparatus and rotate the white plastic collar to tighten. The collar should be tightened enough not to move when you gently twist it but not overtightened, which risks tearing the filter.
4. Attach the flexible plastic tube of the hand pump securely to the open outlet on the bottom part of the filtering apparatus. The other outlet should be covered with a rubber stopper. (If it is not, you can use your finger to create a seal while pumping.)
5. Pour sample water from your 1 liter mixing bottle to the top marking on the filter tower (250 mLs.) Check that no water is leaking from the sides of the filter apparatus. If it is, tighten the connection between the bottom and top units. Make sure to close your 1 liter bottle before you complete the next steps to protect the remaining water from spilling.
6. Gently squeeze the hand pump 3-4 times. The water should flow through the filter. If it slows or stops, squeeze a few more times, but do not over pump. This could damage the filter. Do not allow water to flow into the hand pump tube.
7. When your sample is finished filtering (there should be no more water remaining in the bottom of the filter tower), release the pressure in the apparatus by sliding the hand pump tube off the inlet port. This helps protect the pump from water and will make it easier to

remove the filter. Unscrew the top part of the apparatus from the bottom part. If it is not possible to filter 250mL of the sample, note this on the information sheet.

8. Fold the filter in half, algae side in. Avoid touching the inner part of the filter (the algae sample)- try to grasp only the edge with your tweezers to fold across. Fold in half again into a quarter circle.
9. Place the folded filter on the piece of aluminum foil and fold the foil around the filter to protect it from light. Put the foil packet inside the labeled plastic bag and **immediately put on ice.** Chlorophyll degrades rapidly if not kept cool, which will lead to bad data.



Fill the AWI sample bottle

- If you have not done so already, write the lake name and sampling date on the AWI sample bottle with a permanent marker. We recommend doing this onshore before setting out on your sampling trip.
- Fill the AWI sample bottle by pouring lake water from the 1 liter mixing bottle. Only fill the sample bottle to just below the shoulder so that it does not break in the freezer. Cap the bottle and put it on ice until it can be frozen.
- Record the number written in marker on the bottom of the bottle on your sample information sheet:

Record the number written on the bottom of your AWI sample bottle: _____

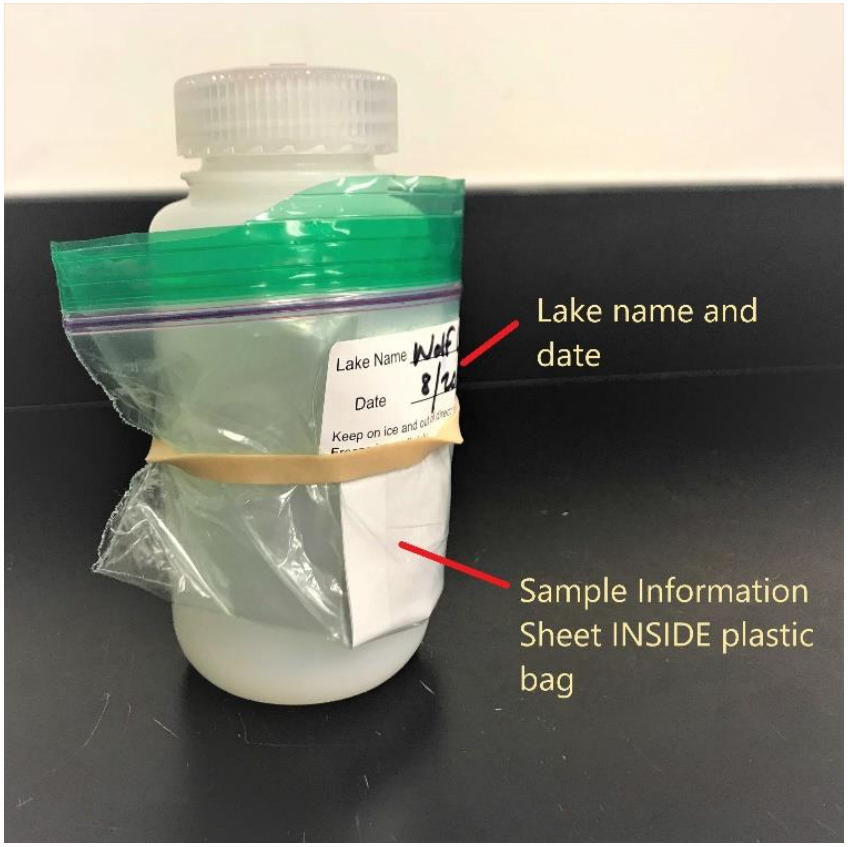
VI. Post Sampling

Cleaning equipment and invasive species spread prevention

- Visually inspect all equipment and remove any organic material and/ or mud from your boat, anchor, and sampling equipment.
- Equipment should be dried thoroughly before storing or using again.
- If you are sampling multiple waterbodies in a day, sample the waterbody least impacted by invasive species first and the most impacted last. The ALAP coordinator will indicate this order at the time of lake selection. If you are unsure of your sampling order, contact the ALAP coordinator.

Pack your sample

- Double check that you have filled out all fields on your sample information sheet. An example of an ALAP Sample information sheet can be found on pg. 10.
- When complete, fold the sample information sheet in quarters and place INSIDE the plastic bag with the chlorophyll sample. This protects the sample sheet from getting wet.
- Write the lake name and date on the plastic bag's label if you have not done so already.
- Attach the plastic bag to the outside of the sample bottle by securing it with a rubber band.
- Place the sample in the freezer.



Deliver your sample to the nearest collection hub

A list of hubs can be found on the ALAP website. If you cannot deliver your sample to the collection hub by the date on the sampling calendar, please contact the ALAP coordinator. This will help us decide how to best make alternate arrangements to receive the sample within an appropriate time window for analysis.

VII. Example sample information sheet:

PROTECT THE ADIRONDACKS!

PAUL SMITH'S COLLEGE ADIRONDACK WATERSHED INSTITUTE

Adirondack Lake Assessment Program

Sample Information Sheet

Please complete one information sheet for each sample taken from the lake.

Lake Name:			
Name of Town or Hamlet:			
Latitude & Longitude:			
Collectors' Names: *(Include all collectors)*			
Primary Collector's Contact Email:		**Primary Collector's Phone Number:**	
Sample Date:		**Sample Time:**	
Did you use an anchor or tie off to a buoy?		◯ Yes ◯ No	

Weather Observations:

Sky Cover:	◯ Sunny	◯ Partly Cloudy	◯ Overcast	◯ Raining	◯ Snowing	
Wind Speed:	◯ Calm	◯ Moderate	◯ Windy			
Water Condition:	◯ Calm	◯ Ripple	◯ Light Chop	◯ White Caps	◯ Swells	◯ Ice
Air Temperature:	◯ Hot	◯ Warm	◯ Cool	◯ Cold		

Make two Secchi disk observations from the shady side of the boat *without using sunglasses*.

Secchi Depth Observation 1:		◯ Feet ◯ Meters	**OR**	**Is the Secchi disk visible and touching the bottom of the lake?** ◯ Yes ◯ No **Secchi Depth:** _____
Secchi Depth Observation 2:				

Record the number written on the bottom of your AWI sample bottle: _____

Please provide any observations or unusual occurrences that may influence the results or your ability to collect your sample:

LAB USE Only
LIMS#
Technician: ____FIMS Entry Complete ____Sample Receipt Emailed ____Scanned

VIII. Sampling Protocol-Quick Guide and Equipment Checklist

Equipment Checklist		
Boat	Integrated tube sampler	Membrane filter
Anchor (if possible)	1 Liter mixing bottle	Tweezers
Life jackets	Secchi disk	Aluminum foil
Cooler with ice	Filtering apparatus	AWI sample bottle
Sample info sheet	Pencil	Permanent marker

1. During the scheduled sampling week, travel to the deepest part of the lake and set an anchor. Fill out the sample information sheet with appropriate descriptive information and label the sample bottle and plastic baggie with a sharpie. **Please test your writing utensil before heading out to sample. Some pens do not work on a smooth, waterproof surface.**

2. Thoroughly rinse the integrated tube sampler, mixing bottle, and the AWI sample bottle and cap with lake water at least three times each.

3. Lower the integrated tube sampler into the lake to the 2-meter line. Insert the cork into the tube and pull the tube up from the bottom so none of the captured water is lost. Empty the contents of the tube into the mixing bottle and mix thoroughly.

4. Fill the AWI sample bottle by pouring lake water from the mixing bottle. Only fill the sample bottle to the red fill line so that it does not break when the water expands when frozen. Cap the bottle and put it on ice until it can be frozen.

5. Place a membrane filter in the filter apparatus and make sure it is centered. Check to make sure both o-rings and the rubber stopper are in place. Assemble the filtering apparatus and pour 250 mL from the mixing bottle into the filter reservoir. Use the hand pump to filter the lake water. If, for some reason, you cannot filter 250 mL, please note how much water was filtered on the information sheet. This is important when calculating a chlorophyll value.

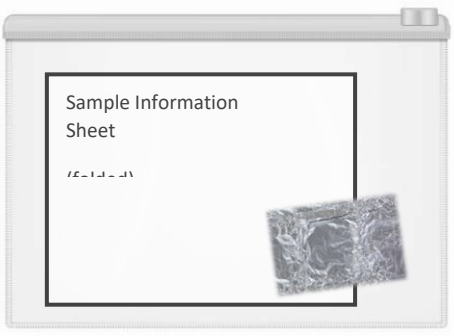
6. When the 250 mL are completely filtered, disassemble the filter apparatus and remove the membrane filter with tweezers. It is helpful to release the pressure from the apparatus by removing the rubber stopper before attempting to remove the membrane.

7. Using tweezers, fold the filter in half (algae side in), then in half again so that it is a triangle, and wrap it in foil. Place the foil in the labeled plastic bag and immediately put it on ice. The chlorophyll will rapidly degrade if not kept cool.

8. Observe the Secchi transparency from the shady side of the boat by lowering the disk to the point where it disappears. Record the depth where it is no longer visible on the information sheet as Secchi Depth Observation 1. Lower the disk a few more feet and then slowly pull it back up until it reappears. Record the depth that it reappears as Secchi Depth Observation 2. Check yes for "Is the Secchi disk visible and touching the bottom of the lake?" if you can see that the Secchi disk is sitting on the bottom of the lake.

9. Make sure the sample information sheet is complete. **Fold it up and place it inside the plastic bag with the filter, this is important to protect the paper during the freeze/thaw process.** Attach the bag to the bottle with a rubber band and freeze immediately.

10. Drop the frozen sample off at the Paul Smith's College Adirondack Watershed Institute or regional collection hub during the scheduled collection week. Complete a chain of custody form when dropping off your sample.



The sample information sheet should go INSIDE the plastic bag with chlorophyll filter package. This should then be wrapped around the sample bottle and secured with a rubber band.