**Chlorophyll-a (Algae Abundance) Monitoring Instructions**

*Tip of the Mitt Volunteer Lake Monitoring Program*

**General Instructions**

All volunteers are required to attend a training prior to monitoring to ensure that quality data are collected. Before or during your first field day, **please write the lake name** and the basin you are monitoring at the top of the datasheet. During each field day, fill in the date/time, weather conditions, monitor names, temperature and volume columns on the data sheet. Use pencils or waterproof pens to avoid ink running/smearing when it gets wet. Remember: **safety first**! Working on water can be hazardous – please take precautions by obeying boating and water safety laws and do not take risks when it comes to bad weather (we would much MUCH rather miss data than miss you!). If have you have any questions, please contact Kevin at (231) 347-1181, ext. 109 or kevin@watershedcouncil.org

**Why monitor chlorophyll?**

Chlorophyll-a is a pigment found in all green plants, including algae. Water samples collected by volunteers are analyzed for chlorophyll-a to estimate the amount of phytoplankton (minute free-floating algae) in the water column. There is a strong relationship between chlorophyll-a concentrations and Secchi disc depth. Greater amounts of chlorophyll-a indicate greater phytoplankton densities, which reduce water clarity and, thus, the Secchi disc depth as well. So why collect chlorophyll-a data? The chlorophyll-a data provides support for Secchi disc depth data used to determine the productivity of the lake, but it can also help differentiate between turbidity caused by algal blooms versus turbidity caused by other factors such as sediments (dirt) or calcite.

The amount of chlorophyll in algal cells varies among species as well as with changing light conditions at different depths in the lake. Changing seasons also create different light conditions that, in turn, affect chlorophyll production. To account for some of this variability, algal chlorophyll is monitored six times over the summer season, every other week from early June to late August.

Collecting a water sample for chlorophyll-a analysis is the most difficult task for volunteers. After checking water clarity, volunteers collect a water sample from the lake’s surface to twice the Secchi disc reading. Research has shown that, because of light attenuation, most algal growth occurs in this zone (2 x Secchi disc depth), which is called the photic zone. The challenge for volunteers is to collect a representative water sample from throughout the photic zone. This is accomplished with the “composite sampler”, which is simply a plastic bottle inside a weighted can that is attached to a measuring tape or rope and lowered through the water. A hole drilled in the cap controls the rate of flow into the bottle. The trick is to lower and raise the sampler at a steady rate, such that the bottle is roughly ¾ full when it reaches the surface. Although seemingly difficult, the volunteers seem to master this sampling procedure very quickly.

Once the water sample has been successfully collected, the volunteer returns home to filter a specific volume of the water sample. A syringe and filter holder are used to push sample water through the filter. The filter is then carefully transferred into a test tube, which is labeled with lake name and date, covered with aluminum foil to prevent sun exposure, and stored in the freezer. At the end of the sampling season, volunteers deliver all tubes with filters and datasheets to the Watershed Council office, which are then transported to the University of Michigan Biological Station for analysis.

Low chlorophyll-a levels indicate relatively small amounts of algae in the lake and generally good water quality. High chlorophyll-a levels indicate heavier algal growth, which could be an indication of water quality impairment. Steady increases or decreases over time in chlorophyll-a concentrations or water clarity indicate that fundamental changes are occurring in the lake ecosystem. Similar to Secchi disc transparency readings, chlorophyll-aresults provide an estimate of the level of biological productivity, or trophic state, of lakes. The median value of the summer chlorophyll monitoring results is used to calculate the Carlson TSI value for the lake, which is compared with the Secchi disc and total phosphorus TSI values for trophic status determination.

**Chlorophyll-a Water Sample Collection and Filtering Instructions** (Perform this test bi-weekly)

*Equipment needed: composite sampler, tape measure or rope, clothespin or other marker, brown/amber bottle, syringe, filter holder, filters, tweezers, bowl, tube, cap, label.*

Part One--Collecting the Water Sample

1. Measure out twice the Secchi disc depth reading on the measuring tape or rope and mentally note this depth or mark with a clothes-pin or other item.
2. Rinse the composite sampler twice at monitoring site with lake water, filling half way, capping, shaking vigorously, and emptying into lake.
3. Lower the sampler over the boat (on the same side as the Secchi disc reading was collected) at a constant rate until it reaches twice the Secchi disc depth (or when the clothes-pin or other marker reaches the surface of the water).
4. Immediately raise the sampler at the same rate it was lowered. When the sampler reaches the top it should be almost full (at least ½ full, but not completely full). NOTE: If it is filled to the top or less than half full, take another sample. The water sample needs to be representative of the photic zone, which extends from the water surface to the depth where enough sunlight penetrates to allow algae to grow. The photic zone is approximately equal to twice the Secchi disc depth.
5. After collecting the water sample, rinse the brown bottle twice with a small amount of sample water and then fill the brown bottle completely with sample water and place into a cooler.

Part Two--Filtering the Water Sample

1. The filtering of the sample should take place as soon as you return to your home. This part of the test should be conducted away from direct sunlight in a semi-dark room.
2. Set out all materials needed for filtering the water sample. Materials include syringe, filter holder attachment, filters, tweezers, tube, label, and bowls for holding water.
3. Rinse out the bowl that will hold the sample water with a small amount of sample water. Pour a portion of the sample water into the bowl.
4. Withdraw a full 60 cc of water from the bowl with the syringe, place the empty filter holder on the end of the syringe and push water through to rinse these items.
5. Unscrew the filter holder assembly, use tweezers to place one filter on the apparatus, make sure rubber O-ring is in place, and reassemble (screw back together).
6. Fill the syringe with 60cc of sample water, attach the filter holder, and press the water through the filter. Check the printed labels to determine if more than 60 cc are needed for the lake you are monitoring. If 120cc are needed, refill the syringe and press through the same filter. If more than 120cc are required, use a second filter (i.e., the maximum amount of water pressed through 1 filter = 120cc).
7. Next, unscrew the filter holder, carefully remove the filter with tweezers, place the filter into a plastic tube, and cap the plastic tube.
8. Fill in the date on the prepared labels and affix to the tube.
9. Cover the tube with aluminum foil and place in the freezer. Store until the fall.

**Things to Remember:**

* Chlorophyll samples should be collected every other week from early June to late August (6 samples total).
* Check the composite sampler to make sure it is securely connected to the measuring tape or rope.
* Water samples for chlorophyll-a filtration should be a composite from twice the Secchi disc depth.
* If the bottle in the composite sampler is completely full when you pull it out of the water, then it is not a representative sample and the procedure should be repeated.
* Keep the water sample dark and cool until filtered.
* Place filter paper in tube using tweezers. Do not touch the filter.
* Record the date on the label and affix to the tube.
* Cover the tube in aluminum foil and store in the freezer.
* If you go out of town, try to arrange for a substitute monitor (many lakes have alternates - call the Watershed Council for their names).
* Return datasheets and chlorophyll-a sample tubes in September or October (keep tubes in a cool, dark place during transport, e.g. a cooler).
* If you see anything unusual, please note it on your datasheet with the date. If a potentially serious water quality problem, please contact the Watershed Council.