Water Testing Presentations

By: Diana Van Vlymen *Friday, July 25th, 2014*

Good morning, board of directors and TLA members. My name is Diana Van Vlymen, and today I'm going to give a brief presentation on the results of our environmental water testing. We have been continuing with the environmental monitoring initiated fully in spring 2012. We use several pieces of specialized equipment to collect water samples and evaluate 43 locations spread throughout the lake – a few in every arm, and several throughout the Hub. The large number of locations we test is required for scientific reliability in the data.

We use three main pieces of equipment: the Secchi disk, Van Dorn collection bottle, and the ProODO probe. We also measure pH with a digital pH meter, giving us average readings of 8.1. This may seem high, but it is still within the acceptable range for lakes, and several of the streams and water bodies feeding Temagami have high limestone concentrations due to the large Temiskaming deposit. Lake Temagami itself is a moraine basin, and it is reasonable to conclude that the nearby limestone is present along our shoreline too. Limestone has a high buffering capacity, and with current reductions in mining activity and pollution from the Sudbury area, it makes sense that the pH levels have rebounded in recent years. After all, most lakes with exceptional clarity are alkaline (ie. pH > 7.0), since most algae species function best in acidic conditions (ie. pH < 7.0).

The Secchi disk measures turbidity – you use it by determining at what depth you can no longer see the disk. The vivid black and white markings are standard for this piece of equipment, meaning that the Secchi depth determined can be considered a relatively accurate measure of water clarity. Lakes with good clarity have Secchi depths greater than 5 metres. We found Lake Temagami's Secchi depth this year to be 6.8 metres, meaning that its clarity is exceptional. This is consistent with the Secchi depths we collected in 2012 and 2013.

ProODO, or Professional Optical Dissolved Oxygen, is a measure of how much oxygen is available in the water column for life to survive in the lake. A probe is sent down on a long cord and records temperature and dissolved oxygen at metre intervals to the bottom, which may reach as much as 75m (about 250 feet)! Temperature is important, as colder water can hold more oxygen than warmer water. Here **[slide 4]** the blue line is temperature and the red line is dissolved oxygen. As you can see, the temperature decreases with a resulting increase in the dissolved oxygen. This year's dissolved oxygen is not as smooth as other years, since there was some really strange weather when we went out to sample. By the time we were able to access the lake due to the late ice-out, the season was already beginning to change rapidly. However, I would like to point out that the water temperatures reflect far less variability than surface air temperatures, as evidenced by this graph here **[slide 5]**. The green line represents this year, and it is evident that the temperatures overall were in line with previous years, especially at depths of 20 metres or more. From this graph **[slide 6]**, we see that this year's dissolved oxygen levels (in green) are in line with previous years, especially in comparison to last year (that's the blue line). The curve is just far less smooth, due to irregular heating shortly after ice-out.

I'd like to show one more graph **[slide 7]** in reference to dissolved oxygen. This is what the trend looks like in summer. Once again, the blue line is temperature and red is dissolved oxygen. The steep drop in temperature is called the thermocline, and corresponds with a strong increase in dissolved oxygen. The thermocline divides the shallow water from the deeper water, preventing mixing due to density differences. Therefore, the dissolved oxygen must remain high enough in the deep water after the spring is over that life in the lake can continue. But Lake Temagami has ample oxygen to supply the aquatic community. A minimum level of 5 mg/L is suggested for coldwater fish like lake trout to survive, and we have seen about 11.5 mg/L at the lowest, about double what is required.

Our main concern in environmental water quality testing is the phosphate ion, measured using the Van Dorn bottle **[slide 8]**. This bottle is set up by pulling both suction cups on the end into the mechanism on the side, allowing water to move through freely as the bottle is lowered through the water column. Once the correct depth is reached, a messenger weight is released, releasing the suction cups and closing the bottle, trapping water from that exact depth! We pour this water into test tubes, which are analyzed at the Trent University field lab using colorimetry. The trend we have seen over the last years is a very minimal increase in our levels, which are about 4 µg/L currently. And it is increasing more slowly as time moves on. This means that we have to watch our phosphate levels, but efforts made by the TLA, cottagers, and campers are beginning to pay off in reducing the rise in phosphate.

Phosphate is so important because it is the mobile form of phosphorus, a key nutrient required for all life. It is a critical building block of both proteins and nucleic acids like DNA. In particular, phosphate is an indirect measurement of phytoplankton content for freshwater ecosystems. Phytoplankton are tiny organisms (algae) in the water column that function like plants, collecting sunlight and carbon dioxide to perform photosynthesis creating energy for themselves and dissolved oxygen. In this way, they support the whole food web. Therefore, being able to measure the levels of phytoplankton allows us to determine the health of the lake. The TLA also intends to initiate chlorophyll *a* testing as a more direct measure of phytoplankton content. Look for this in the fall *Temagami Times*.

However, you've heard me intimate that less phosphate is better for lake health. Lake Temagami is naturally an oligotrophic lake, meaning low productivity best maintains natural balance in populations of the organisms here. Human presence has caused problems like out-of-control algal populations due to increased phosphate on other lakes. Therefore, it is very important to keep extra phosphate out of Lake Temagami! This can be done by ensuring septic tanks are up to code and not leaking, since sewage has a very high phosphate content. Have you ever wondered why the grass is so green over your septic field? Think of how much extra algae would grow if an old, rusty septic tank was leaking sewage into the water near your island! An equally important issue is the potential contamination of your drinking water, if you draw from the lake. If your septic tank was installed before 1975, now is the time to get it checked! Another important way to limit phosphate input is to use only phosphate-free soaps and wash up well away from the shoreline. Phosphate is unnecessary in soaps, yet most companies still use it because phosphate is the cheapest alternative. It is more important in hard water applications than the soft water of our lake. Finally, please don't use fertilizers. If a plant needs fertilizer to grow, it's not well adapted to this environment. There are lots of beautiful flowers that will survive without fertilizer, and your shoreline would benefit from supporting natural vegetation. Plus, you get to enjoy the butterflies, songbirds, and bumblebees that recognize and go after wildflowers!

So, to conclude, I would like to thank you for your time and to remind you that new septic tanks, natural vegetation, and phosphate-free soaps like those we sell at the headquarters building over the summer can support the health of our lake, and protect it for generations to come!