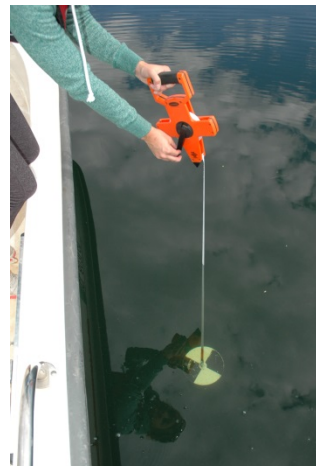


2015 Water Quality Summary Series – Water Clarity

Since 2003, water quality scientists have observed and sampled Barr Lake and Milton Reservoir twenty times a year for a variety of water quality parameters. These 240 trips to both reservoirs have produced an abundance of data and information. This is Part 7 of a continuing series summarizing the 2015 water quality data. The other summaries focused on pH, Chl-a, oxygen, temperature, phosphorus, and nitrogen; this one discusses water clarity.

The Big Picture – Many lakes, reservoirs, and even estuaries and bays throughout the world experience “*cultural eutrophication*”. This term means that water bodies tend to become more productive and shallower over relatively short periods of time due to increased inputs of nutrients and sediments from human impacts in the watershed. Eutrophication is a natural process, but it generally occurs over a much longer geological period. This accelerated aging of lakes causes a quick biological response – severe algae growth. This response then leads to other chemical and physical changes within the water column – pH, oxygen, water clarity, water color, and aesthetics.

Secchi Depth – This is the measurement of water clarity. There are many things that influence water clarity. Algae, zooplankton, silt and dirt, and anything else that is suspended in the water can affect clarity. Water also has dissolved elements (e.g., tannic acids from decomposing organic matter like leaves) that change the color of water and impact clarity. Water clarity is mostly influenced by planktonic algae in Barr and Milton. During major rain events, incoming water can be turbid from dirt and urban runoff. Clarity is another response variable to the overall condition of the reservoir and the watershed.



Measuring water clarity with a Secchi Disk on the shady side of the boat

Water clarity is typically expressed in units of meters (m) or feet (ft) and measured with a Secchi disk. The disk is an 8” diameter, black and white disk that is lowered in the water until it disappears. This practice of measuring water clarity has been around since 1865, and it is a useful way to quickly measure the health of a lake and track changes in water quality. Volunteers across the country use the Secchi disk as part of state-wide volunteer lake monitoring programs.

People are comfortable getting into the water and being able to see their feet thus, water clarity of two meters or better is considered desirable. There is no state standard for water clarity, but any clarity over 2 meters would be favorable for **Barr** and **Milton**.

2015 Water Clarity Data – Secchi depth is measured from the shady side of the boat during each visit. The disk is attached to a tape measure. The disk is first lowered until it disappears. This is the lowering depth. Then the disk is lowered a couple of meters and then the raising depth is recorded once the disk reappears as it is brought up. The average of the lowering and raising depth is the Secchi depth. For 2015, there were 20 depths recorded for each reservoir (Table 1).

Table 1. Barr Lake and Milton Reservoir 2015 clarity data (m). Bold values are less than 2 meters.

| Month | Secchi Depth (Barr) | Secchi Depth (Milton) |
|-------|---------------------|-----------------------|
| Jan | 1.40 | 7.05 |
| Feb | 0.95 | 7.00 |
| Mar | 0.85 | 1.05 |
| Mar | 0.80 | 1.80 |
| Apr | 1.00 | 5.30 |
| Apr | 5.70 | 4.40 |
| May | 2.80 | 4.60 |
| May | 3.20 | 5.80 |
| Jun | 3.25 | 4.60 |
| Jun | 2.30 | 2.75 |
| Jul | 0.80 | 3.15 |
| Jul | 1.05 | 1.00 |
| Aug | 1.45 | 1.20 |
| Aug | 0.95 | 0.90 |
| Sep | 0.80 | 0.70 |
| Sep | 0.80 | 0.60 |
| Oct | 0.70 | 0.10 |
| Oct | 0.50 | 0.20 |
| Nov | 0.70 | 0.40 |
| Dec | 0.60 | 0.80 |

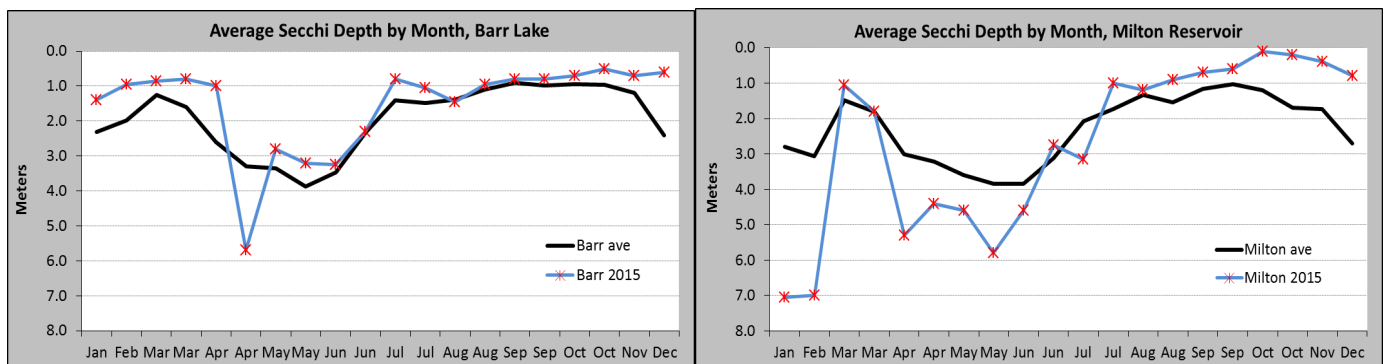
The average Secchi depth for **Barr Lake** in 2015 was 1.53 m and 2.67 m for **Milton Reservoir**. Both reservoirs experience the typical spring clearing phase when the zooplankton are grazing on the diatom bloom. Milton’s clarity under ice for January and February was as deep as the lake sediments.

The growing season (July – September) average for **Barr Lake** was 0.98 m and 1.26 m for **Milton Reservoir**. Typically, the growing season average is lower than the annual average because of algal growth.

Figure 1 shows the annual cycle and 2015 results for water clarity. **Barr Lake’s** clarity changed in response to algal activity. The spring diatom

growth resulted in about three foot of clarity, clarity increased in the spring with no algae present, and clarity decreased again in the growing season as driven by blue-green growth. 2015 was a good example of an average water clarity year. **Milton Reservoir** had higher than normal spring water clarity. The diatoms did impact the water clarity during the spring. Clarity was highest from April to early July. The 2015 drawdown in Milton resulted in clarity decreasing to one meter or less from early August to December.

Figure 1.



TSI Score – The Trophic Status Index (TSI) is a scoring system that measures the eutrophic level of a lake or reservoir by using water clarity, phosphorus, and Chl-a. The widely used Carlson TSI was developed by Bob Carlson in 1977. The Carlson TSI is a way to integrate complicated environmental measurements into a single score that is comparable between lakes. The TSI works well in north temperate lakes that are phosphorus limited. This is the reason why the average TSI is much different compared to the TSI score associated with just water clarity. The phosphorus TSI scores are in the hypereutrophic range while the water clarity is more eutrophic (Figure 2). The TSI values within the Eutrophic to mesotrophic range (45 – 60) seem to be a reasonable score for warm-water, shallow reservoirs such as Barr Lake and Milton Reservoir.

Figure 2. 2015 TSI scores for Barr and Milton, July - September

