

WESSERUNSETT LAKE WATER QUALITY REPORT - 2018

The Lake Stewards of Maine (LSM) Volunteer Lake Monitoring Program (VLMP) water quality sampling program for Wesserunsett continued for the 37th consecutive year in 2018. John Bonsall was the primary monitor and Jay Conway assisted in some of the monitoring. Both were certified as monitors by the LSM (VLMP). Will Reid chaired the LWA Water Quality Committee and provided administrative support for the program. Jay and Will were also members of the LWA Road Committee, chaired by Mark Doty, which was created to address water quality problems caused by roads.

Program Purpose: The primary purpose of this sampling program is to monitor selected biological and physical parameters over the long-term in order to detect any changes and trends. If monitoring results indicate existing or potential problems, actions may possibly be taken in time to prevent or at least reduce increases in nutrient loading or to reverse unwanted changes.

Sampling: Monitoring was done one to two times a month from early June into mid-September. Data collected in seven monitoring trips included Secchi Disk depth (water clarity), Temperature, Color, Dissolved Oxygen (DO), Total Phosphorus (TP) and *Gloeotrichia echinulata* density. John emailed sampling results to Will and sent completed data forms to LSM (VLMP). John also presented results at monthly LWA meetings. Will measured rainfall, recorded Ice-In/Ice-Out dates, calculated open water duration and prepared this 2018 final report and a summary version plus updated data tables going back to 1982. The number of monitoring trips per year for the 37 years of sampling has ranged from seven (2018) to 33 (1994), averaging 17.1. The LSM (VLMP) prefers that monitoring be done at least twice a month two weeks apart for five consecutive months.

Secchi Disk: Water transparency (how deep into the lake sunlight penetrates) was determined by using a Secchi Disk. This is an 8" diameter disk painted with alternating black and white quadrants which is lowered into the water and viewed through a tube called a Lawrence scope. Secchi Disk transparency is affected by several factors, including algae, which are usually the most abundant particles in lakes. Transparency therefore is considered an indirect measure of algal growth. The lower the transparency, the greater the amount of algae. Water clarity readings taken on the seven trips from June into September averaged 5.97m (19.58 ft) deep, with no readings being on the bottom. In 2017, the average for ten trips was 17.1 ft, also with no readings on the bottom. There have been only ten years in the 37 years of sampling during which the Secchi Disk was not visible on the bottom in any of the readings taken. Seven of those 10 years were after 2001. The annual mean readings for Wesserunsett during the period of 1982-2018 have ranged from a low of 16.4 ft (24 trips) in 1984 to a high of 22.3 ft (25 trips) in 1988. The long-term average of annual means for Wesserunsett for 37 years (1982-2018) is 19.2 ft. While the 2017 average Secchi Disk depth of 5.2m (17.1 ft) in 10 trips was less than the long-term average, the average of 19.6 ft (7 trips) for 2018 was slightly greater than the long-term average. For comparison, the long-term mean Secchi Disk depth for 1386 LSM (VLMP) Maine lakes was 4.81m (15.8 ft) as reported online (10/23/18) by LSM, so Wesserunsett continues to be substantially clearer than many Maine lakes..

Water Temperatures: Surface temperatures ranged from 68.7°F on June 1 to 77.9°F on August 17. Bottom temperatures ranged from 71.4°F to 77.2°F during July and August, higher than in 2017. While the temperatures were too warm for trout and salmon, this is typical for this lake in the summer. The Maine Department of Inland Fisheries and Wildlife stocks brown and brook trout in the spring and fall for

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put-and-take fishing and expects them to be caught in a short period of time. It considers Wesserunsett to be a warmwater lake for fisheries.

Color: Levels measured with the LWA Hach Color Test Kit (Model CO-1), ranged from 18 to 20 Platinum-Cobalt units, and averaged 18.7 SPU. This was the lowest annual mean in 12 years of data. Lakes with color levels greater than 25 SPU are considered to be sufficiently colored to depress Secchi transparency and can also cause phosphorus levels to be elevated, so this is a good result. The average of Wesserunsett annual means for 12 years during 2005-2018 is 21.04. In comparison, the long-term mean for all 1127 LSM lakes is 28 as reported online (10/23/18) by LSM, so Wesserunsett color levels continue to be lower than those of many Maine lakes.

Dissolved Oxygen (DO): Levels were measured from the surface to the bottom one to two times a month June through September, with the LWA YSI 550A meter, which has had a tendency to give low readings over the years. Five of the six DO surface readings were less than VLMP tabular saturated DO values, suggesting that the meter continues to read low. However, all but one of the low readings was within the DEP criterion of a maximum of 1.5 mg/l variance. Given the shallow depth and the lack of thermal stratification in Wesserunsett, DO is generally not a critical factor. Levels were therefore likely sufficient to support all species of fish present in the lake at all depths.

Total Phosphorus (TP): Surface grab samples were taken once each month in July and August and sent to the State's Health & Environmental Testing Laboratory (HETL) in Augusta for analysis. Both samples had 7ppb TP. The annual means for Wesserunsett surface TP for 14 years of sampling during 2003-2018 range from 4.4 ppb in 2015 to 9.5 ppb in 2014, with the average annual mean being 6.96 ppb. In 2014, levels ranged from 7 to 12 ppb and its average of 9.5 ppb is the highest ever in our data base. As excess phosphorus can result in unwanted algae blooms, the increased levels measured in 2014 were high enough to warrant concern. Except for 2014, the Wesserunsett TP levels have been at the low end of the category of medium level of productivity (4.5 – 20 ppb TP) for Maine lakes according to the LSM (online 10/23/18). TP levels are high enough at times to warrant concern and should be monitored at least five times each season.

***Gloeotrichia echinulata*:** This organism is a cyanobacteria that can affect eutrophication and produce toxins that can harm waterfowl, fish, pets and humans. Seven density estimates ranged from 0 to 0+ on the LSM Abundance Estimation Density Scale for *Gloeotrichia echinulata* (0 to 6). These very low densities, as in 2014 through 2017, are encouraging.

Rainfall: Rainfall was collected in a rain gauge and amounts recorded daily from April 12 through November 10, after which the weather turned cold with snow, sleet and rain. The gauge was located in Madison near the lake from May 30 to September 30, and in Skowhegan before and after that time period. The total rainfall amount from April 12 through November 10 was 30.45". During the 139 days from Ice-Out on April 29 to the last sampling on September 14, total rainfall was 17.84". In comparison, the rainfall total from Ice-Out to the last sampling date for 2017 was 16.53" (133 days), for 2016 it was 17.30" (161 days), for 2015 it was 19.14" (148 days) and for 2014 it was 24.24" (143 days). While total rainfall may be a factor that influences lake productivity, rainfall intensity can be extremely important as short-term intense events can result in significant amounts of phosphorus being washed into the lake. In 2018, for Wesserunsett/Skowhegan 36% (11.1") of the total rainfall occurred in the two months of June

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and August. In 2017, 45% (12.03”) of the total rainfall (26.65”) during the eight months of May through November occurred in just two months, May and October. Rainfall was not as concentrated or intense in 2018 as it was in 2017 and presumably less phosphorus washed into the lake as a result.

Open Water Season: Ice-Out in 2018 was on Apr. 29 and final Ice-In was on Nov. 19, resulting in an open water season of only 204 days (56% of the calendar year). This was the earliest Ice-In observed in records going back to 1986. For the 33 years from 1986 through 2018, the average duration of open water has been 235.5 days (about 64% of the calendar year). Until 2018, the shortest open water season had been 212 days (58% of year) in 1989. The longest open water season was 270 days (74% of the year) in 2006. Length of the open water season can affect lake productivity and is influenced by climate change, so it is important to continue to track it over the long-term, especially given the wide variation over the decades.

Climate Change: Climate change is affecting lakes in a number of ways. According to a scientific article by L. Borre, L., R. L. Smyth & E. A. Howe (2016. At the Forefront of Shoreline Management. Lakeline, NALMS, Summer 2016: 8-13), global lake water surface temperatures are warming, duration of winter ice cover is declining, and more rain is in the form of heavy downpour events. For example, Maine and other northeastern states have had a 71% increase in the amount of precipitation falling in very heavy events from 1958 to 2012. This is supported by the recently released Climate Science Special Report (CSSR) which states that temperature and precipitation extremes can affect water quality and that the largest U. S. increases in heavy precipitation events have occurred in the northeast. The result is more surface runoff and erosion which results in more nutrient pollution and sedimentation. Climate is becoming more extreme. Despite an increase in the amount and intensity of precipitation, an increase in consecutive days without rain is projected. A warming climate and increased development both can accelerate the lake eutrophication process. According to the CSSR, globally 16 of the 17 warmest years on record have occurred since 2001. The Wesserunsett datasets that would directly reflect climate change are Ice-Out, Ice-In, Open Water Season, Water Temperature and Rainfall. Analysis of these datasets is beyond the scope of this report, but it should be done. It can be noted, however, that the two earliest Ice-Outs in 135 years of records were in 2010 and 2012. Also, the longest open water duration in 33 years of records was in 2006 and five of the six longest durations were in 2006, 2010, 2012, 2015 and 2016. However, the later than usual Ice-Outs in 2017 and 2018 and the very early Ice-In and short Open Water Season this year are inconsistent with that warming trend. Again, this emphasizes the importance of continuing to keep long-term records for Wesserunsett.

Conclusions: The results for 2018 were more encouraging, as were those in 2016 and 2015, than those for 2017 and 2014. Colby College in its 2001 report about the lake stated that its future water quality was “uncertain” and that it had reached “... the threshold at which ecologically detrimental algal blooms can occur.” Our data indicates this is still the situation 17 years later. As the article by L. Borre et al. previously mentioned indicates, it is very important to continue the monitoring program and to retain all data for future analysis so that any long-term trends may be identified. Controlling runoff, improving shoreline buffers and reducing erosion and sedimentation from such sources as camp roads and driveways are some of the key measures to take to reduce phosphorus input and help combat the effects of climate change. Each of us should take personal responsibility for protecting the lake by educating ourselves about how our actions impact the lake, and then doing the right thing in order to protect it.

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Please let me know if you have any comments, questions, see any errors, etc. Thanks.

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