

WESSERUNSETT LAKE WATER QUALITY REPORT - 2017

The Volunteer Lake Monitoring Program (VLMP) water quality sampling program for Wesserunsett continued for the 36th consecutive year in 2017. John Bonsall was the primary monitor and Bob McLaughlin and Jay Conway were backups. Will Reid chaired the LWA Water Quality Committee and provided administrative support and data analysis for the program. Bob, 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 both the short- and the long-term in order to detect any changes and trends. Climate change is affecting lakes in a number of ways. According to a journal 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 means 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. However, if monitoring results indicate existing or potential problems, there's a chance that actions may possibly be taken in time to prevent or at least reduce increases in nutrient loading or to reverse unwanted changes, and that's why we are running this program.

Sampling: Monitoring was done one to three times a month from May through September. Data collected included Secchi Disk depth (water clarity), Temperature, Color, Dissolved Oxygen (DO), Total Phosphorus (TP) and *Gloeotrichia* density. John emailed sampling results to Will and sent completed data forms to VLMP. Will measured rainfall, recorded Ice-In/Ice-Out dates, and calculated open water duration. Will prepared monthly summaries of results for LWA and this 2017 final report.

Secchi Disk: Water clarity readings taken on ten trips from May through September averaged 17.1 ft deep, with no readings being on the bottom. In 2016, the average was 21.5 ft, with two readings on the bottom. There have been only nine years in the 36 years of sampling during which there have been no readings on the bottom. The annual mean readings for Wesserunsett during the period of 1982-2017 have ranged from a low of 16.4 ft in 1984 to a high of 22.3 ft in 1988. The long-term average of annual means for Wesserunsett for 36 years (1982- 2017) is 19.2 ft. The 2017 average Secchi Disk depth was less than the long-term average, which is of concern (i.e., the water was less clear). However, it was still greater than the mean Secchi Disk depth for all VLMP lakes of 15.8 ft as reported online (11/13/17) by DEP/VLMP.

Water Temperatures: Surface temperatures ranged from 61.7°F on May 23 to 76.8°F on July 26. Bottom temperatures ranged from 68.4°F to 72.9°F during July and August, lower than in 2016.

Color: Levels measured with the LWA Hach Color Test Kit (Model CO-1), ranged from 18 to 25 Platinum-Cobalt units, and averaged 20.4 SPU. This was lower than in 2016 and not high enough to affect Secchi Disk readings or Total Phosphorus levels. The average of annual means for Wesserunsett for

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11 years during 2005-2017 is 21.25. The annual mean for all VLMP lakes is 28 as reported online (11/13/17) by DEP/VLMP.

Dissolved Oxygen (DO): Levels were measured from the surface to the bottom one to three times a month June through September with the LWA YSI 550A meter. Seven of the eight DO surface readings were less than VLMP tabular saturated DO values, suggesting that the meter continues to read low. Given its 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 June, July and August and sent to the State's Health & Environmental Testing Laboratory (HETL) in Augusta for analysis. The levels ranged from 6-11 parts per billion (ppb), with an average of 8.0 ppb. These levels are higher than in 2015, which were very low. The annual means for Wesserunsett TP for 13 years of sampling during 2003-2017 range from 4.4 ppb in 2015 to 9.5 ppb in 2014, with the average annual mean being 6.8 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. The Wesserunsett TP levels in 2015 and 2016 were at the low end of the category of medium productivity (4.5 – 20 ppb TP) for Maine lakes according to the VLMP, which was very good news after the 2014 results. The total rainfall during the 2015 sampling period was less than in 2014, and even lower in 2016 with the individual rain events being less intense. This likely resulted in less erosion and transport of sediment that would carry phosphorus to the lake. However, this was the situation during the 2017 sampling season, too, yet the TP levels were again high enough to warrant concern.

Gloeotrichia: Density estimates ranged from 0 to 0+ on a scale of 0 to 6 in the 10 estimates that were made. These are low densities, as in 2014 through 2016. This is encouraging because *Gloeotrichia echinulata* is a cyanobacteria with a complex lifecycle that can affect eutrophication and produce toxins that can harm waterfowl, fish, pets and humans.

Rainfall: Rainfall was collected in a rain gauge and amounts recorded daily from April 18 through December 9. The gauge was located in Madison from May 20 to September 19, and in Skowhegan before and after that time period,. The total rainfall amount was 29.52". During the 133 days from Ice-Out on April 28 to the last sampling on September 8, total rainfall was 16.53". In comparison, the rainfall total from Ice-Out to the last sampling date for 2016 was 17.30" (161 days). For 2015 it was 19.14" (148 days) and for 2014 it was 24.24" (143 days). However, 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. Maine rainfall in 2017, as described by Scott Williams in the VLMP Fall newsletter, was substantial early in the season followed by an extended dry period. That fits the predicted pattern for climate change as presented in the article by L. Borre et al. For Wesserunsett, 45.1% (12.03") of the total rainfall (26.65") during the eight months of May through November occurred in just two of those months, May and October.

Open Water Season: Ice-Out in 2017 was on Apr. 28 and, after several temporary partial ice-ins, final Ice-In was on Dec. 11, resulting in an open water season of 227 days (62% of the calendar year). For the 32 years from 1986 through 2017, the average duration of open water has been 236.4 days (about 65% of

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the calendar year). The shortest open water season was 212 days (58% of year) in 1989. The longest open water season was 270 days (72% 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.

Climate Change: According to NASA, 16 of the 17 warmest years on record for the planet have occurred since 2001 (<http://climate.nasa.gov/evidence/>). 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 134 years of records were in 2010 and 2012. Also, the longest open water duration in 32 years of records was in 2006 and five of the six longest durations were in that year, 2010, 2012, 2015 and 2016. In addition, rainfall was substantial in May and October, and relatively sparse in August. All of these observations are consistent with a pattern of warming.

Conclusions: In contrast with the encouraging results in 2016 and 2015, those for 2017 and 2014 were not. As the article by L. Borre et al. indicates, it is very important to continue the monitoring program and to retain all data for 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. Wesserunsett does not thermally stratify and has a high flushing rate, both of which help in maintaining or enhancing water quality. However, these features do not preclude algae blooms from occurring. 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 16 years later. It is therefore essential that each of us takes personal responsibility for protecting the lake by educating ourselves about water quality, especially regarding how our actions impact the lake, and then doing the right thing in order to protect it.

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

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