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2012 Washington Lakes Water Quality Report

Baseline water quality monitoring of Crystal and Washington Ponds was conducted on August 24, 2012, in accordance with standard procedures for the monitoring of Maine lakes and ponds established by the Maine Department of Environmental Protection and the Maine Volunteer Lake Monitoring Program. The 2012 sampling was done in a manner consistent with the historical sampling of these bodies of water, and the results are comparable.

This report contains information gathered in late August by LWRMA staff, along with data gathered by certified volunteer lake monitors. The volunteer data have been integrated into summary findings.

2012 Weather Influences :

Weather conditions prior to, and during the annual lake monitoring period can strongly influence indicators used to assess water quality. Several meteorological phenomena occurred in 2012 that appear to have had a measureable negative effect on lakes and ponds throughout Maine:

1. Winter and spring weather was unusually warm, resulting in the earliest ice-out conditions on record (mid- March) for many Maine lakes.
2. Ambient air temperatures in the 80 degree F. range were recorded in March. This resulted in the rapid warming of lake water, and the development of thermal stratification (temperature layers) several weeks earlier than normal.
3. In early June, a severe rain event dropped several inches of rain (up to 8 inches in some areas) in a period of less than 48 hours, resulting in extremely heavy and erosive stormwater runoff from lake watersheds.
4. This was followed by many days of unusually warm weather. Water surface temperatures of 80 degrees F. were recorded in many lakes and ponds in the region by the end of June.

The combined influence of these unusual conditions resulted in below average water clarity, an extended period of thermal stratification, higher than normal dissolved oxygen loss for many lakes, and a measureable increase in algae growth – all of which can be characterized as stressful to lake systems.

Summary:

Each lake and pond responds in a unique way to the influences of weather, changes in land use in the watershed, and other forces upon the ecosystem. This is because of the wide range of physical, chemical and biological characteristics of each lake basin and its watershed. Most lakes and ponds experience a moderate amount of natural annual variability.

Overall, Washington Pond experienced a somewhat below average year in 2012, based on water clarity readings, total phosphorus and chlorophyll-a samples and dissolved oxygen profiles. The water was less clear, and there was more algae growth in 2012, (based on a limited number of samples). Even though the single phosphorus sample taken in August was relatively low for the pond, other factors, including the persistent loss of dissolved oxygen during late summer, indicated that overall conditions were somewhat below the historical average for the lake.

Based on a single set of readings and samples, Crystal Pond appears to have experienced a somewhat above average year. In late August, the water was very clear, and the concentration of both phosphorus and algae were relatively low. However, as has been the case with most of the limited historical data for Crystal Pond, late summer dissolved oxygen levels were depleted in the deepest areas of the pond.

Note that in addition to the water quality assessment that was done in 2012, LWRMA staff also surveyed the immediate area of the public boat launch sites for both ponds for invasive aquatic plants. None were observed.

Both ponds were also checked for the presence *Gloeotrichia echinulata*, a planktonic blue-green algae that has been on the increase in Maine lakes in recent years. There was no evidence of this alga on August 24 in either pond.

As has been noted in the past, both ponds experience a severe loss of oxygen during the late summer. This phenomenon is has the potential to depress overall water quality over a period of time. Low oxygen levels may lead changes in other indicators of lake water quality by as much as two decades.

The most effective way to insure that all indicators of lake water quality remain stable – or even improve over time – is through watershed stewardship. This includes raising awareness among landowners about ways in which the effects of development on water quality can be minimized, and developing a community plan to protect and manage the watershed. . Citizen watershed surveys can be very effective in raising community awareness and identifying and resolving land use problems. The Maine Volunteer Lake Monitoring Program offers workshops for groups interested in conducting watershed surveys. The LakeSmart program offered by COLA is also an excellent way to effect positive change in lake watersheds.

Washington Pond

Water clarity (transparency, or the distance that one can see down into the water, using a Secchi disk and monitoring scope) is used as an indirect indicator of algal growth in lakes. On August 24, transparency measured 6.1 meters (about 20 feet). Additional water clarity readings were collected from June through early October by volunteer lake monitors Roger Cady and Rob Stenger. The average for all readings taken in 2012 is 5.7 meters. This is substantially lower (less clear) than the historical average for the period from 1977 through the present. The historical average for Washington Pond 6.7 meters. The 2012 average is one of the lowest annual water clarity averages for the lake on record. In comparison, the average in 2011, based on 3 months of sampling by volunteers, was 6.8 meters. The comparison of annual averages must take into account the variation from one year to the next in the amount of available data for the lake. The low average for 2012 was very likely influenced by the weather factors described above.

A surface (epilimnetic core) total phosphorus sample taken on August 24 measured 4 parts per billion (ppb). Prior to 2012 phosphorus was last sampled in 2008, at which time the sample measured 8 ppb, and in 2007, at which time phosphorus measured 6 ppb. The historical average phosphorus concentration for Washington Pond is 6 ppb. Since 1979, surface phosphorus levels have ranged from a low of 4 ppb to a high of 8 ppb. Phosphorus is the nutrient that most directly influences the growth of algae in lakes and ponds. Phosphorus concentrations in the 12-15 ppb range have been associated with algal blooms in some Maine lakes. The 2012 phosphorus sample concentration was one of the lowest on record for Washington Pond, as was the case for Crystal Pond. As is the case with nearly all indicators of lake water quality, phosphorus concentrations can vary considerably throughout the year, and the results may not be in phase with other indicators because of the complex dynamics of lake ecosystems.

Chlorophyll-a (CHL) is the pigment measured in lake water that is used to determine the concentration of algae in the water. The CHL level in August measured 5.0 ppb, which is the highest concentration on record for Washington Pond. The annual historical average for the pond is 2.5 ppb, and the next highest individual reading of 4.2 ppb was measured in 2001. Since 1979, the annual average CHL concentration in this lake has ranged from a low of 1.8 ppb in 1982, to a high of 3.5 ppb in 2001. The 2012 sample is in the moderate range, and is consistent with lower water clarity readings recorded during the course of the summer. Weather factors described above are likely to have influenced the 2012 findings.

A temperature and dissolved oxygen profile taken on August 24, 2012 showed severe oxygen loss in the deepest area of the pond, from a depth of 7 meters to the bottom of the deep sample station at 11.0 meters depth. Similar late summer oxygen profiles have been documented in Washington Pond in past years, although the 2012 results were among the most severe in terms of the percentage of the volume of water in the lake that was completely devoid of oxygen at the time of sampling on August 24. Temperature and dissolved oxygen profiles taken in earlier in the summer indicate that the anoxic conditions form relatively early in the monitoring period, but that by the middle of

September, Washington Pond had de-stratified, or "mixed", resulting in the restoration of healthy oxygen levels throughout the lake.

Oxygen depletion during the summer months has the potential to have a negative impact on the overall water quality of Washington Pond over time. The low oxygen levels are an indication of the accumulation of organic matter in the bottom of the lake, primarily algae, which, through the process of decomposition by bacteria, causes oxygen in the surrounding water to be depleted.

When oxygen levels near the bottom of a lake are critically low, there is the potential for phosphorus to be released from the bottom sediments to the overlying water, where it may stimulate the growth of algae growing closer to the surface. A phosphorus sample taken near the bottom of the deep station at Washington Pond in August measured more than twice the concentration (10 ppb versus 4 ppb) of the sample taken at the surface on the same day. This suggests that phosphorus is being released from the bottom sediments, as a result of low oxygen in the overlying water.

Water color, pH, and total alkalinity were also measured in August. Each was found to be within the range of historical values for this lake.

Crystal Pond

Water clarity (transparency, or the distance that one can see down into the water, using a Secchi disk and monitoring scope) is used as an indirect indicator of algal growth in lakes. On August 24, transparency measured 7.1 meters (about 23 feet). This was the only known reading to have been done on Crystal Pond in 2012, and is therefore the average for the year. In general, historical water clarity readings for Crystal Pond have ranged from low readings in the 5 meter range, to very clear readings, such as the one taken on August 24, 2012. The historical average for this lake, dating from 1977, is 5.9 meters, and will likely increase as a result of relatively high 2012 reading. Water clarity in this lake is generally higher than the average for Maine lakes. Substantially less historical data are available for this body of water, compared to Washington Pond.

A surface (epilimnetic) total phosphorus sample measured 3 parts per billion (ppb), compared to a similar sample measuring 6 ppb in 2007. Prior to 2007, phosphorus was last sampled in 2003, at which time the result was 9 ppb. The historical average phosphorus concentration for Crystal Pond is ~8 ppb. Since 1997, surface phosphorus levels have ranged from a low of 6 ppb to a high of 9 ppb. The 2012 sample concentration is the lowest on record for this pond. Phosphorus is the nutrient that most directly influences the growth of algae in lakes and ponds. Phosphorus concentrations in the 12-15 ppb range have been associated with algal blooms in some Maine lakes.

Chlorophyll-a (CHL) is the pigment measured in lake water that is used to determine the concentration of algae in the water. The CHL average in 2012 measured 2.1 ppb, compared to 3.7 ppb in 2007, 2.2 ppb in 2003, a 1999 sample that measured 3.7 ppb, and the historical average of 3.4 ppb for Crystal Pond. Since 1997, the annual average CHL concentration in this lake has ranged from a low of 2.2 ppb in 2003, to a high of 4.2 ppb in 1997. The 2012 sample concentration is the lowest on record for the pond, suggesting

low algae growth during the summer of 2012. The average of 3.4 ppb, is considered to be in the "low-moderate" range for Maine lakes and ponds, consistent with the generally good water clarity in Crystal Pond.

A temperature and dissolved oxygen profile taken on August,24 showed severe oxygen loss in the deepest area of the pond, from a depth of 5 meters to the bottom of the deep sample station at 8.1 meters depth. Similar late summer oxygen profiles have been documented in this pond in past years. This phenomenon has the potential to have a negative impact on the overall water quality of Crystal Pond over time. The oxygen findings are in stark contrast to the otherwise "very good" conditions measured in the pond in 2012. The low oxygen levels are an indication that the lake is both sensitive and stressed by external factors in the lake ecosystem, which includes the watershed.

When oxygen levels near the bottom of a lake are critically low, there is the potential for phosphorus to be released from the bottom sediments to the overlying water, where it may stimulate the growth of algae growing closer to the surface under certain circumstances. A phosphorus sample taken near the bottom of the deep station at Crystal Pond in August measured nearly four times the concentration (11 versus 3 ppb) of the sample taken at the surface on the same day. This suggests that phosphorus is being released from the bottom sediments, as a result of low oxygen in the water.

Water color, pH, and total alkalinity were also measured in August. Each was found to be within the range of historical values for this lake.

The most effective way to insure that all indicators of lake water quality remain stable – or even improve over time – is through watershed stewardship. This includes raising awareness among landowners about ways in which the effects of development on water quality can be minimized, and developing a community plan to protect and manage the watershed. Citizen watershed surveys can be very effective in raising community awareness and identifying and resolving land use problems. The Maine Volunteer Lake Monitoring Program offers workshops for groups interested in conducting watershed surveys. The LakeSmart program offered by COLA is also an excellent way to effect positive change in lake watersheds.

Thanks to both Roger Cady and Rob Stenger for volunteering their time and resources to gather additional information for Washington and Crystal Ponds in 2012!

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