Report on the Health of Thompson Lake

2009

Compared to the historical averages for indicators of water quality, Thompson Lake experienced a somewhat below average year in 2009. This might come as no surprise, considering the exceptionally wet summer, and the resulting stormwater runoff from the watershed. However, the summer of 2008 was also very wet, and Thompson experienced a very clear (good) year, when many Maine lakes showed a significant decline in clarity. On the other hand, 2007 was a very dry year, when many lakes throughout Maine were clearer than they had been historically. But Thompson was below average in 07.

Thompson Lake has undergone a number of dramatic swings over the years in what are considered to be the four prime indicators of lake health: the distance that one can see down into the water (aka water clarity or transparency), the concentration of phosphorus in the lake, the concentration of algae (measured as chlorophyll-a), and the amount of oxygen that is dissolved in the water from the surface to the bottom of the lake during the late summer.

Last summer, the average water clarity for the lake during the five month (May-September) monitoring period was 9.1 meters (about 30 feet), compared to 10.0 meters (about 33 feet in 2008, and 8.2 meters in 2007. The historical average for the lake is 9.0 meters, which is considerably higher (better) than the “average” water clarity for all Maine lakes, which in 2009 was 5.14 meters (based on the annual average of nearly 500 lakes).

The average concentration of phosphorus in the lake during the five month monitoring period was 3 parts per billion (ppb), compared to 4 ppb in 2008, and the historical average of 5 ppb. The average concentration of chlorophyll-a was 4.1 ppb, compared to 2.2 ppb in 2008, and the historical level of 2.6 ppb. While the average concentration of phosphorus in the lake was slightly lower (better) in 2009, the concentration of chlorophyll-a, a more accurate indicator of the concentration of algae in the water, was nearly double what it was in 2008. This was consistent with somewhat less clear water last summer.

The amount of oxygen that is dissolved in the water in the deepest area of the lake during the late summer (August and September) is a critical indicator of overall lake health. Thompson Lake has maintained high levels of dissolved oxygen through the summer/fall period for as long as data have been collected for the lake – even in the deepest area of the lake near Hayes Point. This characteristic of exceptional water quality is the primary factor that allows coldwater fish to thrive in the lake. Dissolved oxygen levels measured throughout the monitoring period in 2009 remained high, and were consistent with levels that have been documented historically. On September 19, at a depth of 108 feet, and a water temperature of 9.0 C., the dissolved oxygen concentration was 7.4 parts per million – the lowest level in the water column, from the surface to the bottom of the lake. The critical oxygen level for cold water fish species (Trout and Salmon) is ~5.0 parts per million.

Additional water quality indicators, including pH, water color, and total alkalinity were monitored throughout the season. All were within the normal range of historical values for the lake. Despite the extensive rain and runoff last summer – or perhaps because of it – the color level of the water was low, as is the historical average for the lake.

All of the data described above were collected at the deepest known location in the lake, which is situated northwest of Hayes Point in the Town of Oxford.

We are continuing to monitor the presence of Gleotrichia in the lake. This blue-green algae often appears in Thompson during mid to late summer. It floats near the surface, and has the appearance of tiny, fuzzy, off-white dots. Gleotrichia is sometimes described as looking like “tapioca in the water”. It is a normal component of lake algal communities, and it appears in Maine lakes having a wide range of water quality, including several similar in size, depth and quality to Thompson. But this tiny plant has also been associated with water quality problems in several Maine lakes, and, for reasons not fully understood, it may be on the increase. Gleotrichia concentrations in Thompson continue to be very low. We will continue to carefully monitor it’s presence in the lake.

The Heath:

Every few years, the area located at the south end of the lake, known as “The Heath” is monitored. This area of the lake, separated by the public road and a large culvert, is very shallow, filled with aquatic plants and diverse species of insects, amphibians, fish and terrestrial critters that depend on the plants and animals that live in the Heath.

The water quality of the Heath reflects the rich community of plants and animals, and the shallow, rich bottom sediments. The water is less clear, contains higher levels of natural color from decomposing wetland plants (sometimes known as “root-beer” color), and there is more phosphorus in the water from these influences.

We monitored the Heath on August 15, at which time it was possible to see the bottom of the lake at the spot we sampled from – about 2.3 meters (~7.5 feet) depth. The

phosphorus concentration measured 8 parts per billion – much higher than levels in the open lake, but lower than the historical average for the Heath (14 ppb). The algae level, as determined by the concentration of chlorophyll-a in the water, was actually lower (2.5 ppb) than the average for the open area of the lake last summer (4.1 ppb), but it was lower than the historical average for the Heath. The color level of the water was higher than average for the Heath, no doubt due to the extensive flushing of wetlands that fed into the area last summer.

Although Variable milfoil is present in the Heath, we observed a diverse and relatively balanced community of native plants that were helping to keep the milfoil under control. It is important to protect native plant communities for this reason alone. But native plants provide many benefits for fish and wildlife, as well. Power boats are not allowed in the Heath, in order to protect the delicate ecosystem of this area of the lake.

Statewide Perspective on 2009 Lake Water Clarity:

To put into perspective the significance of the 2009 water clarity findings, consider that out of 457 Maine lakes that were assessed last year, 39.2% were clearer,50.1 % were less clear, and 10.7% were unchanged, compared to their historical average (Figure 2). The clarity of many of Maine's lakes has declined significantly during the past two years, compared to 2007, when a much higher percentage of lakes were clearer than they had been historically.

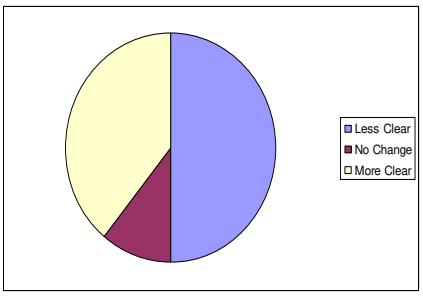

Figure 2: Percentage of 457 Maine Lakes that were clearer, less clear, or unchanged,compared to their historical average in 2009 (Source: MDEP VLMP)

and

It is likely that the decline in the number of lakes that were clearer than average in 2009 was the result of heavy snow melt during the spring, and moderate to severe rainfall throughout much of Maine during the summer period. In fact, 2009 was one of the wettest years on record for the State of Maine. Information obtained from the National Weather service indicated that Portland, and much of Maine experienced record precipitation.

Spring runoff from melting snow and rain typically carries a high percentage of the annual phosphorus load to lakes from their watersheds. The annual phosphorus load to a lake from its watershed has a strong bearing on water clarity throughout the summer monitoring period.

Figure 3 shows the extent to which water clarity (Secchi transparency) has varied for Maine lakes over time. The chart shows the average, and the range of averages of water clarity for all Maine lakes monitored in a given year. Note that this average has, for a

majority of the years since this information has been tracked, fallen between 5.0-5.5 meters. Variation from one year to the next is influenced by many factors, not the least of which is weather. However, the natural rate of flushing, the extent of watershed development and other influences also have a bearing on lake water clarity.

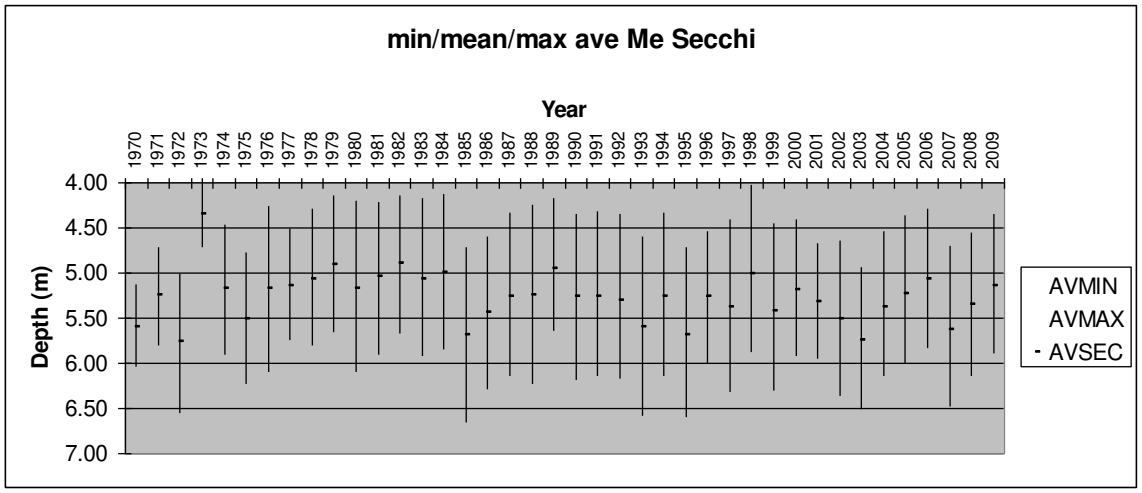

Figure 3: Average, Maximum and Minimum Secchi Transparency (Clarity) Readings for Maine Lakes
Source: MDEP and VLMP

This illustration shows that for the period from 2004-2006, the "average" clarity of Maine lakes dropped substantially. This may have been due to the fact that much of the state experienced above average precipitation during the period. In 2007, Maine lakes as a whole were significantly clearer, most probably due to relatively little precipitation throughout the state during the winter, spring and early summer months. But in 2008 and 2009, along with a reduction in the percentage of lakes that were as clear as they were in 2007, the overall water clarity for Maine lakes declined. Note that the average maximum and minimum lake water clarity for 2009 also dropped, compared to 2008 and 2007.

The graph shows that a number of similar changes have occurred historically. Some of the "clearest" years have been those during which drought has recently occurred, such as 1985 and 2002 and 2003, which followed the severe statewide drought of 2001.

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. That is because of the wide range of physical, chemical and biological characteristics of each lake basin and its watershed. Most lakes and ponds experience moderate levels of natural annual variability.

Water clarity (Secchi transparency) is one of four primary indicators of the biological productivity of lake ecosystems, in addition to the concentration of the nutrient

phosphorus (TP), the concentration of chlorophyll a (CHL), a plant pigment used to measure of the concentration of algae in lake water, and dissolved oxygen levels in deep areas of the lake during the summer months. The combined information obtained from these indicators provides a general picture of the health of individual lakes.

Thompson Lake does not necessarily follow statewide trends, possibly because the lake has a relatively slow natural flushing rate (.29/year). It takes slightly more than three years for the large volume of water in Thompson Lake to be completely replaced or flushed from water that flows into the lake from the watershed.

There is no question that this lake continues to be one of Maine's clearest and cleanest. The dramatic swings in water quality that have been documented over the years may be an indication that, despite indicators of very good health, the lake is sensitive to pressures from its developing watershed. To date, the lake has always rebounded from years when conditions have been below average. But we should not assume that this will always be the case. TLEA's proactive effort to protect the lake through wise watershed stewardship is Thompson Lake's best hope for continued good health.

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