Kezar Lake Water Quality Report

2006

Baseline water quality monitoring was conducted on the two main basins of Kezar Lake from May through September, 2006. Indicators of lake water quality that have been checked in past years were measured and sampled, using methods and protocol for lake assessment established by the Maine Department of Environmental Protection.

Overall, Kezar Lake experienced an “above average” year in both the north (North Bay) and south (South Bay) basins of the lake, where monitoring has taken place for more than three decades. Conditions in the north basin were somewhat better than in the south, although this was partially due to natural differences in the characteristics of the two basins. The north basin is relatively deep (~155 feet maximum depth, 34 feet average), whereas the south basin is shallow (~15 feet maximum depth, 8-10 feet average). These differences, combined with the fact that water entering the north basin comes directly from a relatively undeveloped watershed, whereas water in the south basin passes not only through the north and middle area of the lake, but receives drainage from several smaller ponds in the watershed, cause the south basin to be more turbid, and to have higher concentrations of nutrients.

User perception surveys that have been conducted in Maine, and throughout the U.S., have consistently shown that the characteristic of lakes that is most highly valued by the public is “clear water”. Water clarity, also referred to as “Secchi transparency”, is the distance that one can see down into a lake from the surface. It is one of several key indicators used to assess the quality of Kezar, and other Maine lakes.

The 2006 water clarity average for the north basin (monitoring station 01) was 8.7 meters (28.3 feet), compared to 8.2 meters in 2005, 9.2 meters in 2004, and the historical average of 7.7 meters (25 feet). Thus, water clarity averaged a full meter (approximately 3 feet) clearer in 2006 than the average for Kezar Lake during the period from 1970-2005)!

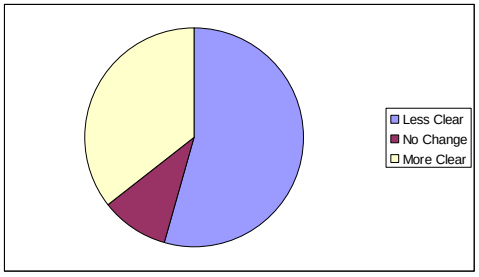
The water clarity average for the south basin (station 03) was 3.4 meters, compared to 3.5 meters in 2005, 3.2 meters in 2004, and the historical average of 3.1 meters at this station.

However, as has been noted in previous reports, the shallow nature of the south basin limits water clarity. In other words, water clarity is underestimated for the south basin because the device that is used to measure this indicator reaches the bottom of the basin before it disappears from view. For this reason, greater emphasis is placed on other water quality indicators in the south basin, as discussed below.

Additional water clarity readings were taken in the "Middle Bay" (station 02) area of the lake. These readings also reached the bottom of this relatively shallow area of the lake. However, Middle Bay is technically in the same basin as "North Bay" (station 01), since no significant restriction to the circulation of lake water exists between the two areas. Therefore, water quality indicator results for North Bay are equivalent to conditions in Middle Bay. This assumption has been tested through comparative data in previous years.

To put into perspective the significance of the overall excellent water clarity of Kezar Lake, consider that out of 429 Maine lakes that were assessed in 2006, 35.4% were clearer than their historical averages, 54.3 % were less clear, and 10.2% were the same as their historical averages. The average lake water clarity for all Maine lakes declined last year, and for the second year, the number of Maine lakes that were clearer than their historical average declined to fewer than 50%. *However, overall, Kezar Lake was clearer than its historical average.*

Number of Maine lakes that were less clear, unchanged, or clearer than their historical Average in 2006. (Maine Volunteer Lake Monitoring Program and Maine Department of Environmental Protection)



Water clarity is one of three primary indicators of the overall biological productivity of lake ecosystems, in addition to the nutrient phosphorus (TP) and chlorophyll a (CHL), a pigment that is used to measure the concentration of algae in lake water. The three indicators, along with dissolved oxygen, are considered to be key measures of the water quality, and overall health of Maine lakes.

The 2006 average total phosphorus (TP) level for the north basin was 5 parts per billion (ppb), compared to the historical average of 6 ppb. Over the years, annual TP concentrations in north Kezar have ranged from as low as 4 ppb, to as high as 11 ppb (an unusual year). Lakes are particularly sensitive to phosphorus. Maine's cleanest, clearest lakes typically have TP concentrations in the 3-4 ppb range, while lakes with TP levels as low as 12-15 ppb may experience nuisance algal blooms.

The average total phosphorus concentration in the south basin averaged 8 ppb in 2006, compared to the historical average of 9 ppb for this area of the lake. Part of the reason why TP is higher in this area of the lake is linked to the shallow nature of the basin.

Strong winds can cause bottom sediments to become suspended in the water, elevating the concentration of phosphorus. The south basin of Kezar is considered to be somewhat more biologically productive than the northern area.

The 2006 chlorophyll-a (CHL) average was 1.9 ppb (very good) at station 01, compared to the historical average of 2.8 ppb at this station. This finding is consistent with the excellent water clarity and low TP in the north basin. CHL is a direct measure of the amount of algae growing in the lake. Algae are at the base of the lake ecosystem food web, and thus play a very important role in the biological productivity and overall health of the lake. Excess algae growth reduces water clarity and may result in the loss of dissolved oxygen in the water, especially during warm summer months. This, in turn, may stress coldwater fish (trout and salmon).

The 2006 average CHL concentration in the south basin was 2.3 ppb, compared to the historical average of 2.4 ppb. Although higher than levels in the north basin, CHL levels in the southern region of the lake are also relatively low (good!). Low CHL levels in the south basin indicate that the moderate TP concentration is, in part, linked to suspended sediment in the water, because generally lakes that have moderate TP levels, as documented in this area of the lake, would be expected to experience greater algal growth, measured by CHL. The CHL level in the south basin is, as stated above, relatively low.

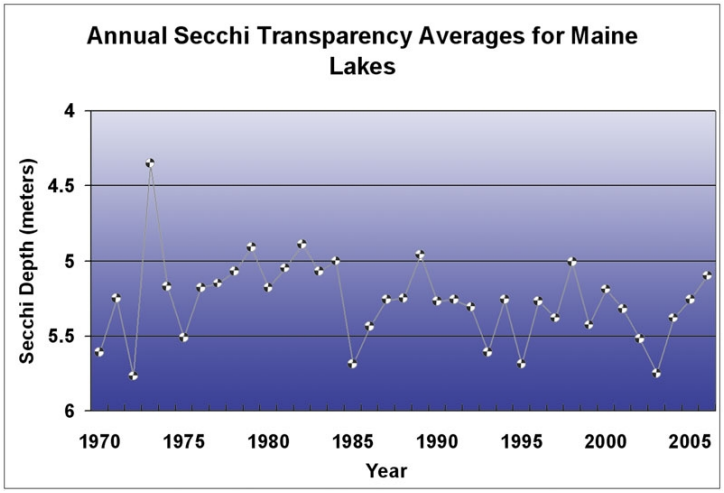
Dissolved oxygen profiles taken throughout the summer, from the surface of the lake to the bottom of the deepest area in the north basin, revealed similar excellent results to previous years. Many Maine lakes experience moderate to severe dissolved oxygen loss in deep areas during late summer (August and September). Oxygen loss is linked to biological productivity, specifically, to algal levels in the lake over time. Kezar Lake retains high (healthy) levels of dissolved oxygen, even in the deepest area of the lake throughout the summer and early fall monitoring period. This is perhaps the most significant indicator of Kezar Lake's excellent water quality. It is also a major factor in Kezar's ability to support coldwater fish species.

Temperature and dissolved oxygen profiles taken monthly during the 2006 monitoring period showed high concentrations of oxygen throughout the lake. There is no apparent trend in oxygen levels in Kezar, over the three decade monitoring period, nor is there any apparent negative trend for any of the key indicators of water quality for Kezar Lake.

Additional water quality indicators monitored in 2006 (pH, total alkalinity, water color and specific conductance) were within normal limits for Kezar Lake, and generally supported the indicators of primary productivity.

The chart below shows the extent to which water clarity (Secchi transparency) varies for Maine lakes over time. The chart shows the average water clarity for all Maine lakes monitored in a given year. Note that the average for all Maine lakes has, for most 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.

Maine lakes may be clearer overall during relatively dry years because stormwater runoff from rainfall carries phosphorus and other pollutants from the watershed to the lake.



Source: Maine Volunteer Lake Monitoring Program

The illustration above shows that for the past three years, the "average" clarity of Maine lakes has been dropping. This may be related to the fact that much of the state has experienced above average precipitation during the period. Or, it may be related to other natural forces that are not known or easily measurable. It can be seen from this illustration, however, that similar declines have occurred historically, sometimes followed by dramatic recoveries. Some of the "clearest" years have been those during which drought has recently occurred, such as 1985 and 2002 and 2003 (possible delayed effects of the severe 2001-2002 drought).

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.

Kezar is one of Maine's clearest and cleanest lakes. By all measures, water quality is excellent. While this message is, without question, positive, it is important to note that Kezar is also sensitive and vulnerable to change, which is why, in 2005 the Maine DEP added Kezar Lake to Maine's list of *Priority Waterbodies.* Throughout its history, KLWA has played a major role in the protection of Kezar Lake. The challenges of maintaining the outstanding conditions that we have all come to expect from this lake continue to grow. KLWA's decision to become a watershed association was a major step toward expanding public understanding and awareness that the protection of Kezar Lake for future generations will be directly linked to watershed stewardship.

Prepared by Scott Williams, Aquatic Biologist