
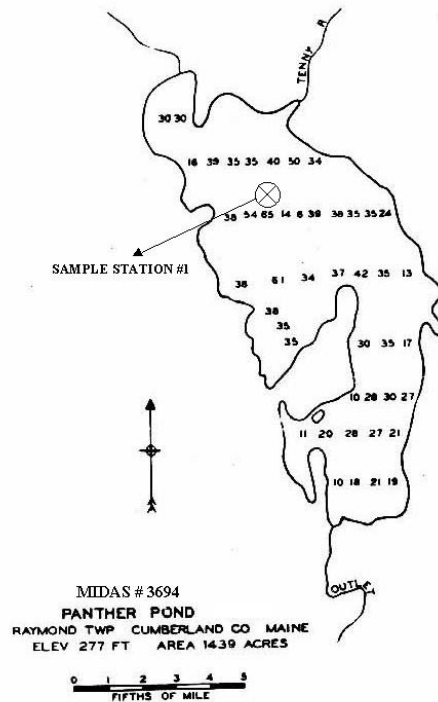


Panther Pond Water Quality

Charlie Turner has been monitoring the water quality on Panther Pond bi-weekly from late spring to early fall since 1984.

The samples have been collected at or near the deepest part of the lake as indicated on the map below during the entire period. . Why sample in the deepest part of the lake? The sample is collected at a location that is representative of the lake water quality and not sporadically influenced by either stream flow or shoreline runoff. Another reason to sample in the deep hole is to allow a temperature and dissolved oxygen profiles to be conducted. A temperature/dissolved oxygen profile is conducted to determine the depth of the thermocline and to determine if the bottom layer is deficient in Oxygen.

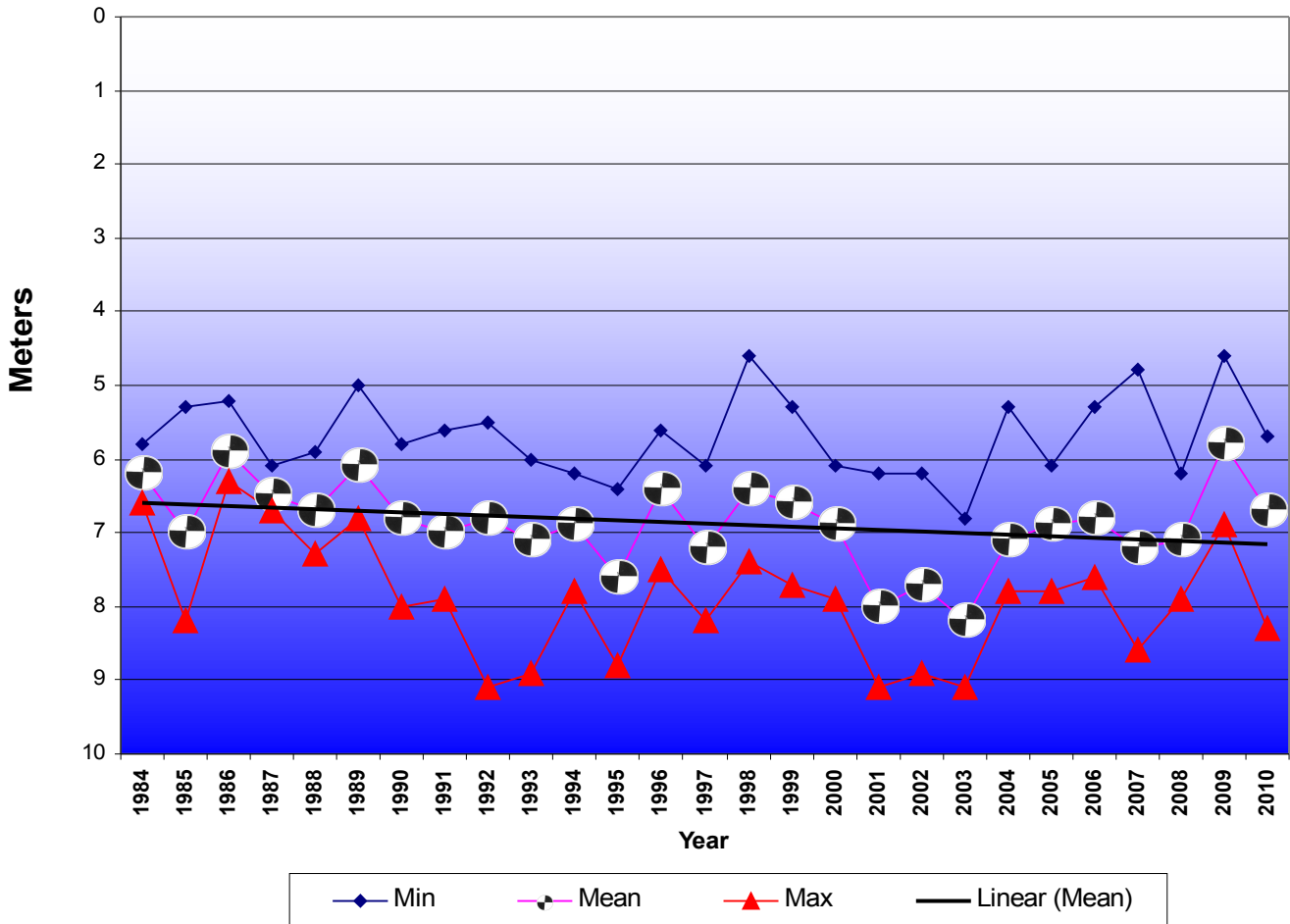
One of the tests that are done on site is called Secchi Disk Transparency. An 8-inch, round disk, which looks like this , is attached to a rope marked off in meters and is lowered into the water until it disappears. There are a number of things that will affect the clarity of the water including algae, suspended particles and color. The color of the water in Panther Pond is low so it has very little effect on the clarity. The color of city water is between 5 and 10 color unity, the color of light tea is around 100, and the color of Panther Pond water is 15.



Secchi Disk Transparency (SDT) – The water clarity as measured by secchi disk is variable from season to season and from year to year as seen in the graph below. The long-term average is 6.9 meters (22.6 feet). How does that compare to other lakes in Maine? The Volunteer Lake Monitoring Program’s 2009 Annual Report states that the overall average secchi disk reading for all monitored lakes in Maine is 4.8 meters (15.8 feet). That places Panther Pond in a good state relative to other lakes in Maine. Over the long term, is the water quality of Panther Pond getting better or worse? Looking at the graph below, the

linear mean (black line) seems to be dropping, indicating that the average secchi disk reading is getting deeper and better. At the very least, even though the trend may not be statistically significant, the water clarity has been stable over the past 27 years.

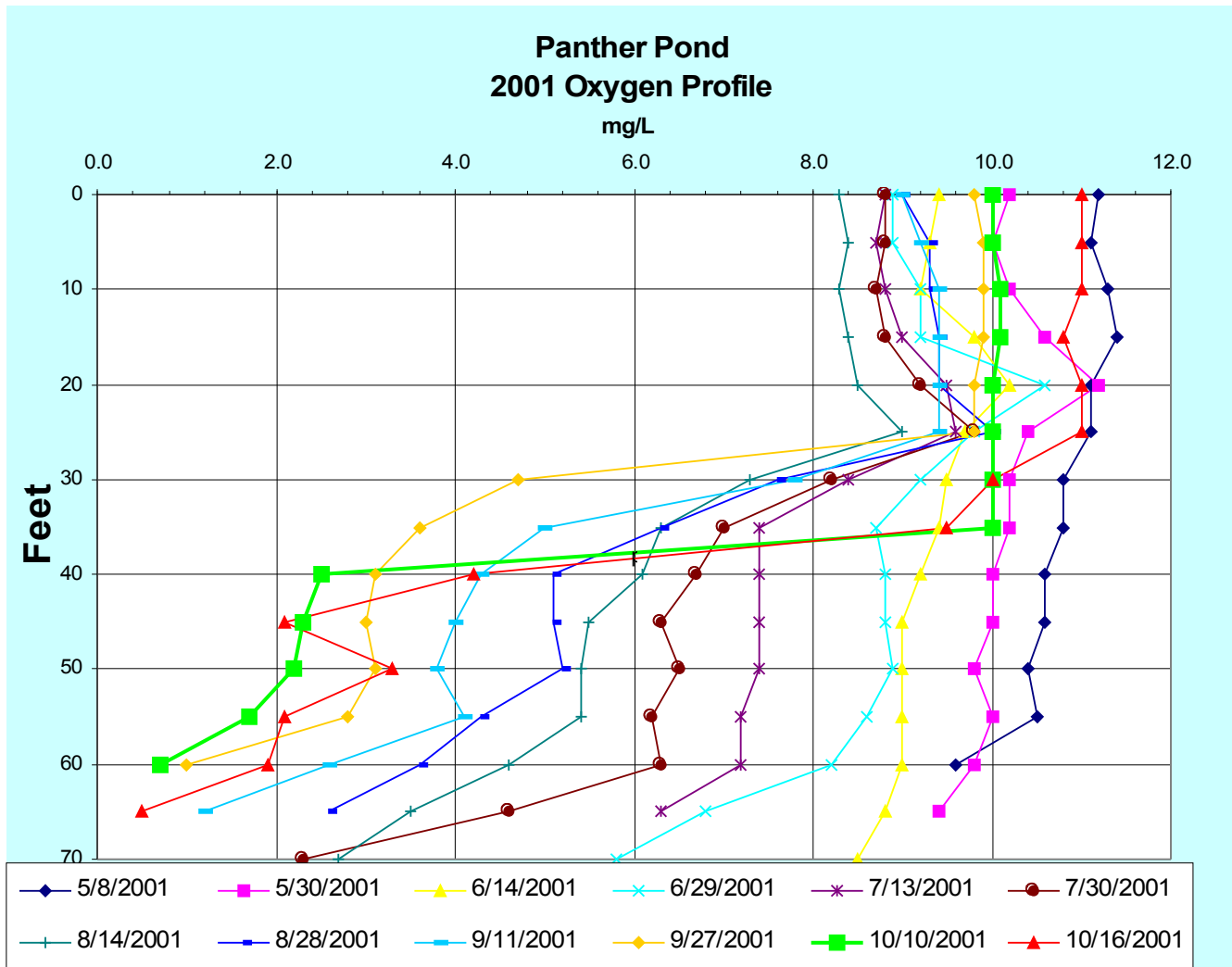
Panther Pond Secchi Disk Summary Data 1984-2010



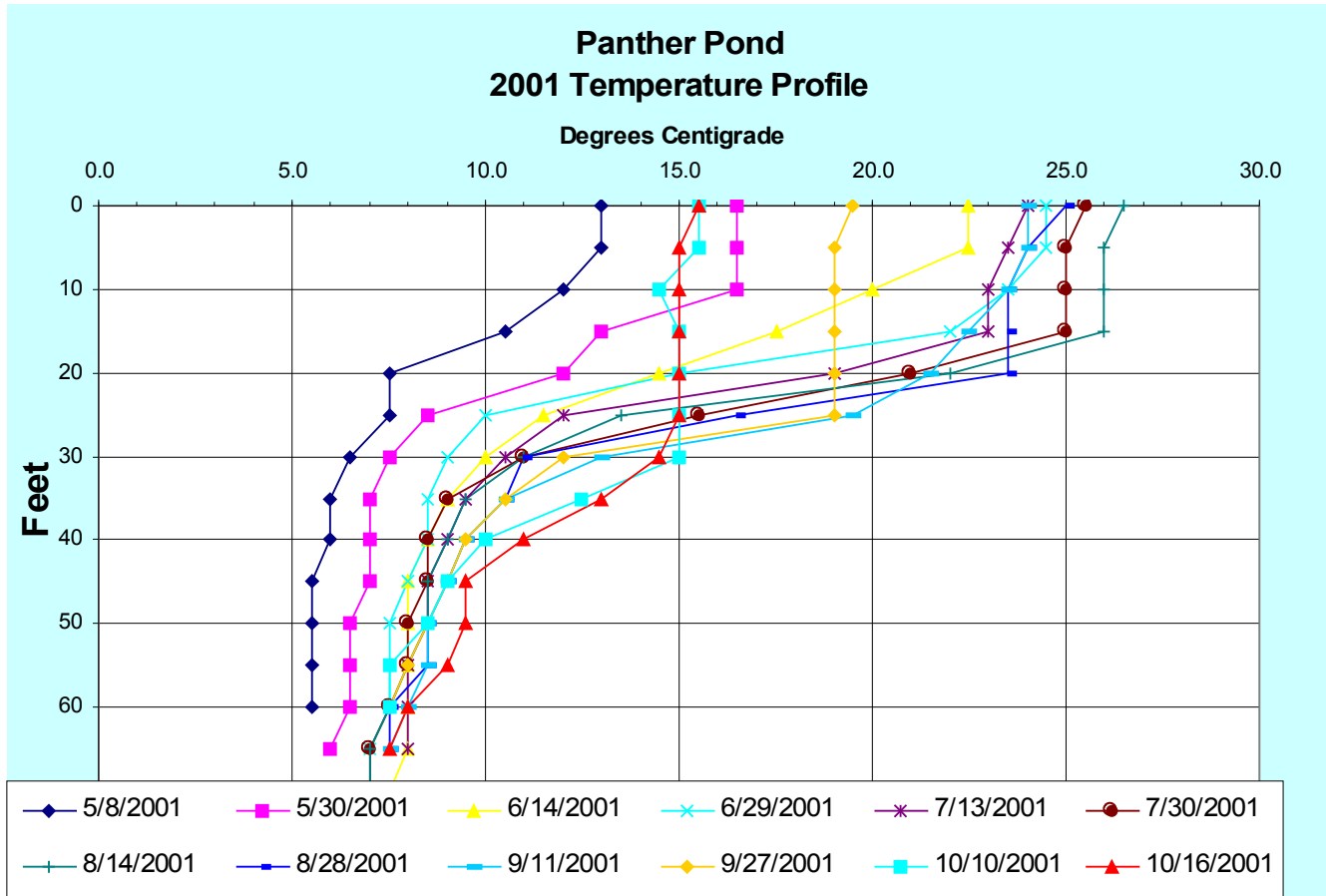
Dissolved Oxygen/Temperature Profiles – The amount of Oxygen in the water is a very good indicator of water quality and has been monitored on Panther Pond for a number of years. Oxygen is essential to fish and other aquatic organisms. Lack of Oxygen or anoxia, however, is very harmful to water quality because it can allow the phosphorus that is tied up in the bottom sediment to become available for internal recycling, and provide additional nutrients for algae growth. Increased algae growth results in more oxygen depletion as the algae dies, decomposes, and settles to the bottom of the pond.

The graph below shows a rather typical progression of oxygen consumption in the water column of Panther Pond as the summer progresses. In the early spring, the levels of oxygen are high and stable throughout the water column as shown by the blue and pink lines in the graph. As also shown in the graph, the oxygen levels drop as the summer progresses but are relatively stable in the top 25 feet and don't drop to less than 8 mg/L. The drop in oxygen in the top 25 feet is not due to algae decomposition,

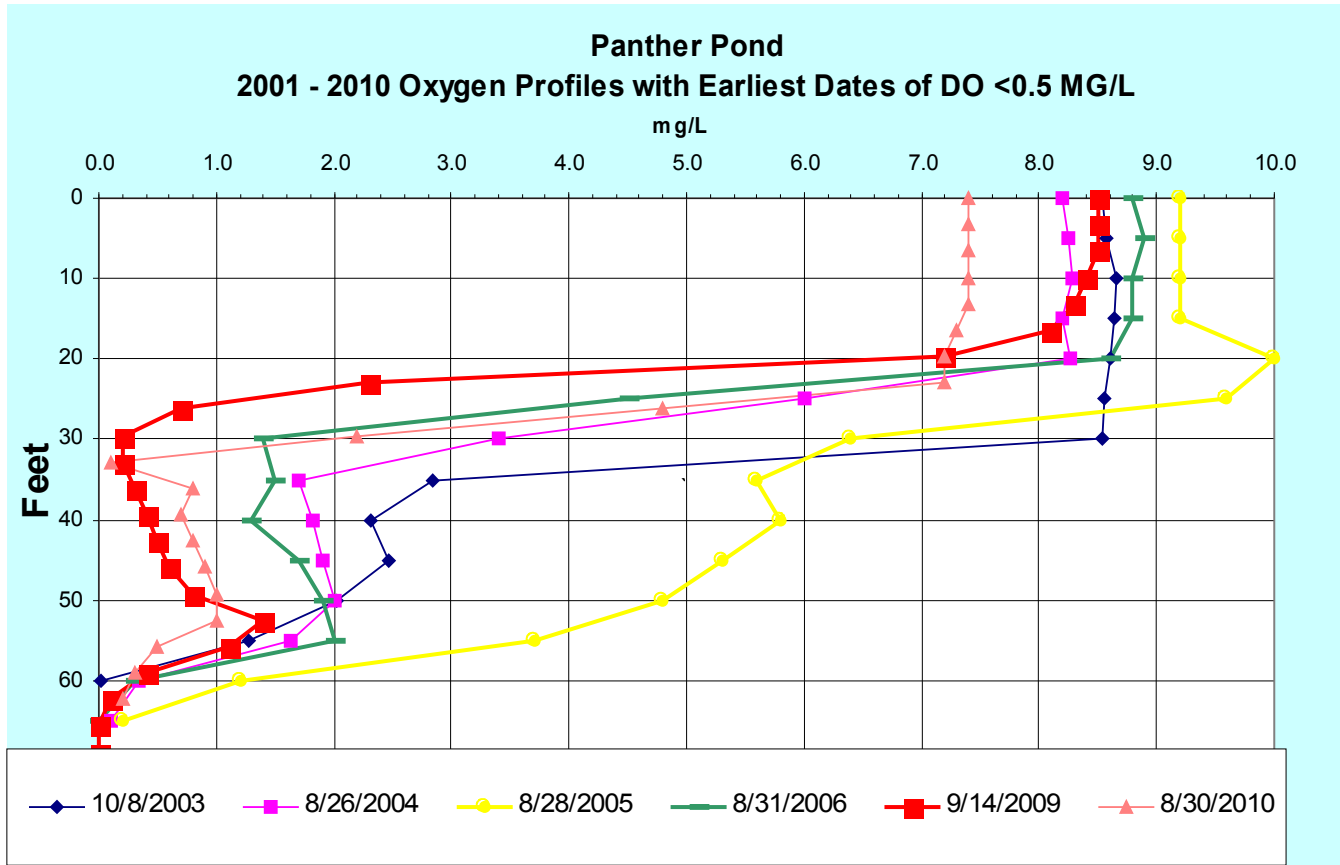
but is the result of a physical phenomenon whereby the Oxygen concentration in water is inversely proportional to the temperature. As the water on the surface warms up, the oxygen levels naturally drop. Below 25 feet, however, there is a significant drop in Oxygen levels as the summer progresses and decreases with depth.



The temperature of the water not only limits the concentration of Oxygen in the water under normal conditions, but it also establishes a physical barrier that prevents mixing of the water column. As the graph of the temperature profiles of Panther Pond below shows, there is a very sharp drop in temperature between 10 and 30 feet. This zone of rapid temperature change is known as the thermocline and becomes sharper and sinks lower as the summer progresses. In the top layer of Panther Pond, there is enough wind action to maintain normal levels of Oxygen. Once the thermocline is established, the Oxygen in the hypolimnion (bottom layer) can no longer be replenished, and is gradually depleted as the summer progresses. This depletion of oxygen is very variable from year to year and dependent on many variables, including temperature, rainfall, sunshine, runoff, erosion, etc.



The chart below shows that the Oxygen levels in Panther Pond do become depleted some years in late summer, which suggests that there could be internal recycling of phosphorus in the bottom layer. What the chart also shows is that there is no consistent pattern of when the oxygen becomes depleted. It can be as early as the last week in August or as late as the first week in October. Even though there may be some internal recycling of phosphorus, it does not mean that the water quality is deteriorating or will get worse in the future. First, the volume of water in the hypolimnion where the Oxygen would be depleted is relatively small compared to the total volume of water in the pond. Second, and most importantly, the watershed survey and erosion control measures implemented and to be implemented under the 319 grant have significantly reduced the amount of phosphorus entering the lake from erosion.



The Maine DEP and the Volunteer Monitoring Program have collected a number of samples for chemical analysis periodically since 1974. Their summary of the data shows that the water column Total Phosphorus (TP) values for Panther Pond are low to moderate, ranging from 5-12 parts per billion (ppb) with an average of 7 ppb. Chlorophyll a values are also low to moderate, ranging from 1.5-4.2 ppb with an average of 2.8 ppb. The potential for TP to leave the bottom sediments and become available to algae in the water column as indicated above is possible but low.

In summary, the water quality of Panther Pond is above average compared to other Maine lakes. With increased public awareness and continuing efforts to reduce the input of phosphorus to the pond, the water quality will remain stable and might even improve over the long term.