Raw Water Algae Counts

Presenting data from 1993-2010

Portland Water District
Sebago Lake Watershed Monitoring Programs
Lake Monitoring

Presenting data from 1993 to 2010

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Introduction

Sebago Lake is the primary drinking water supply for nearly 200,000 people in 11 Greater Portland communities. Lake water was first delivered to Portland in 1869, from an intake located in the southernmost part of the lake, referred to as Lower Bay. In 1908, the Portland Water District was chartered by the Maine Legislature to provide water services to the cities of Portland and South Portland. The water system has gradually expanded to include 11 cities and towns in Greater Portland. Since its inception, the District has been actively monitoring and working to protect Sebago Lake.

In 1993, the District was granted a waiver to the filtration requirements of the federal Safe Drinking Water Act (SDWA) based in part on the purity of the water and the effectiveness of watershed protection efforts. This waiver agreement requires ongoing monitoring of lake water quality. The District maintains more than 10 monitoring and surveillance programs throughout the watershed and lake. In general, as one moves closer to the intakes, more samples are collected and tested for more parameters.

This report summarizes results of the Raw Water Algae Monitoring Program

Methods

Samples for algae analysis are taken once a month from the 1925 building and 1952 building raw water sample lines. 1000 mls from each location are filtered through a sand filter. The sand is washed, and the wash water is viewed with a Nikon phase contrast scope under 200x magnification. The complete method outlined can be viewed at ..\..\..\..\..\LAB\SOP\SOP Summaries\Algae SOP.doc

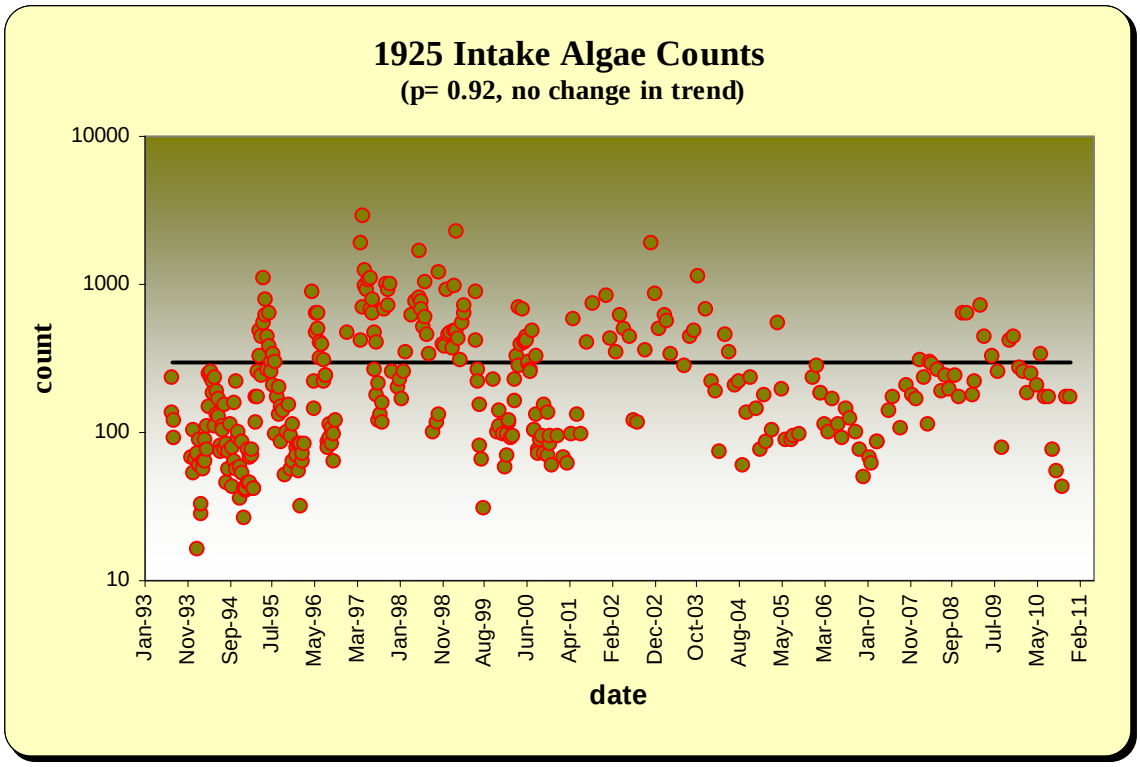
Algae samples have been collected from raw water since the 1970's. The raw water intake pipes were moved in 1993 to a greater depth so a valid comparison of pre-1993 to post-1993 data is impossible. Microscope technology has improved over the years and the comparison of counts using different scope technology would also be impossible. The longest consistent data set is from August 1993 to present and that is the data that will be discussed in this report.

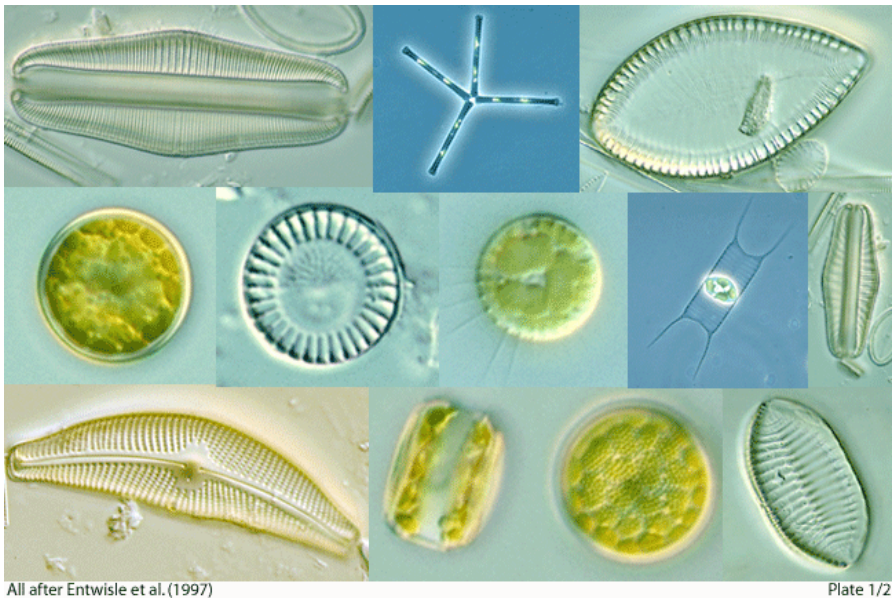
Results and Discussion

Estimating primary productivity trends of a lake by way of algae direct counts can useful as well as frustrating. Frustrating because algae abundance is highly variable and depends on numerous factors; sunlight, rainfall, water temperature, macro-nutrient levels, micro-nutrient levels, O^2/CO^2 concentrations, complex ecological predator/prey interaction, etc. Total counts as well as species variability tends to change dramatically from month to month and probably even day to day within different location of a lake. Useful because direct counts offer real time information on lake health due to the fact that algae respond almost immediately to water quality conditions.

There are many different ways to interpret direct count algae data. One of the easiest ways is to analyze total algae abundance over time. This statistical analysis involves a linear regression of the count plotted on the Y axis and time on the X axis. Results provide a slope of the trend; a positive slope indicates an increase over time while a negative slope indicates a decrease over time. The numeric value indicates the rate of change and a p value indicates the probability of randomness of the trend.

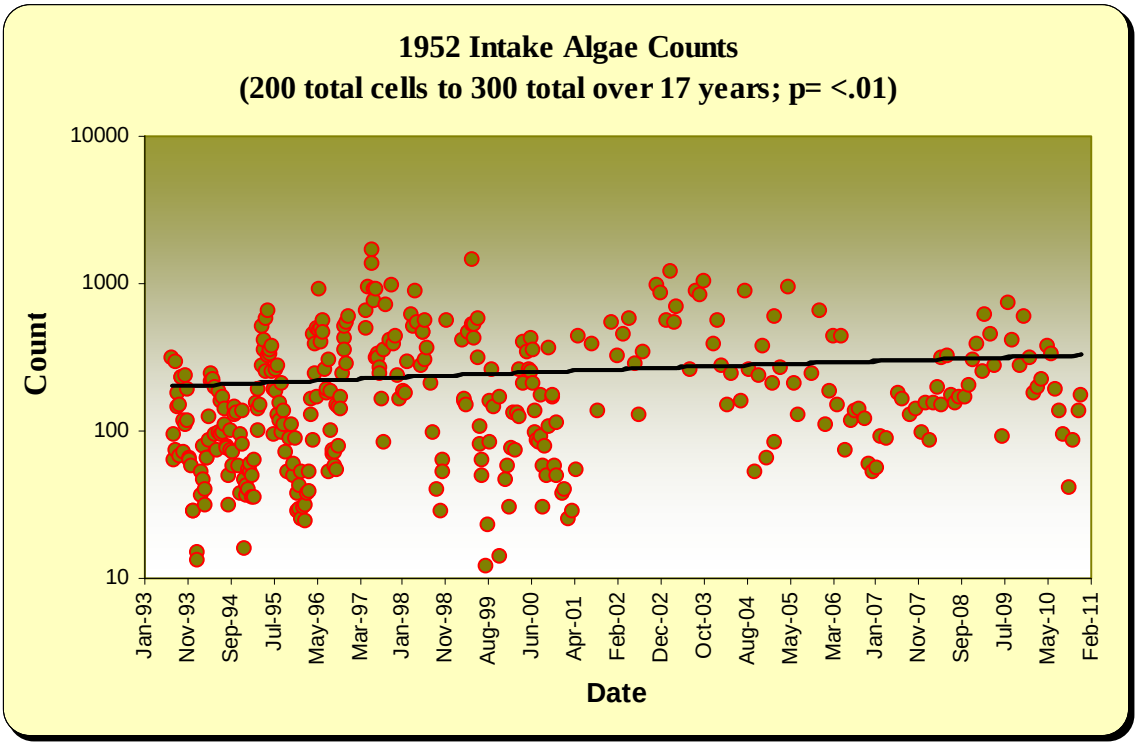
Results of this statistical analysis show no change in the trend of algae abundance from the 1925 intake from 1993 to 2010. Because the data are highly variable, the Y axis on the chart below is logarithmically transformed. This log scale visibly dampens the effect of highly variable data over different orders of magnitude.





Some common diatoms found in Sebago Lake

Results of this statistical analysis show an increase of 6 cells per year in the trend of algae abundance from the 1952 intake from 1993 to 2010. While this trend is statistically significant (meaning the trend is valid) the size of the increase is negligible. Because the data are highly variable, the Y axis on the chart below is logarithmically transformed. This log scale visibly dampens the effect of highly variable data over different orders of magnitude.



Conclusion;

Raw water algae count from the 1925 Intake and the 1952 Intake show similar cycles from year to year. When counts are high at the ’25 Intake they are high at the ’52 Intake. The 1952 Intake has seen an increase of 6 cells per year for the past 17 years while the 1925 Intake has remained statistically constant.

An increase of six cells per year is very low percentage (2.5%) of the annual mean (242).

Even though the change at the 1952 Intake is statistically significant, this low percent annual change is not a major concern. The District will continue to monitor algae concentrations on a monthly basis.