

Sediment report on Half Moon Lake, Bayfield County

Paul Garrison
Wisconsin Dept. of Natural Resources

A sediment core was taken from Half Moon Lake, Bayfield County on 29 August 2012 as part of the U. S. EPA National Lake Assessment. The sections 0-2 cm and 41-43 cm were kept for analyses. The composition of the diatom community has been determined and later this year a radiochemical analysis will be done on the bottom section to determine if this core segment was deposited at least 100 years ago and thus would represent pre-settlement conditions. The diatom community was used to estimate historical and present day mean summer phosphorus concentrations.

In the top sample the diatoms were in very good condition but in the bottom sample many valves were partially degraded. Although diatom preservation in the bottom sample was not as good as I hoped, I feel that it is sufficient to make estimates of historical lake conditions. In both segments, the diatom community was dominated by those taxa which grow attached to substrates such as aquatic vegetation. In fact diatoms that grow in the open water (planktonic) comprised less than 10% of the community in the bottom and top samples (Figure 1). The diatom community indicates that historically the lake had abundant aquatic vegetation and low phosphorus levels. The dominant diatom taxa in the bottom sample were generally larger taxa which are common in low nutrient environments and tend to grow directly on vascular plants. The greatest change in the diatom community between the bottom and top samples was the presence of benthic *Fragilaria* and small celled *Fragilaria* (Figure 1) in the top sample. These diatoms are associated with filamentous algae which are more common at moderate phosphorus levels. The diatom community indicates that historically there was abundant aquatic vegetation and this continues at the present time.

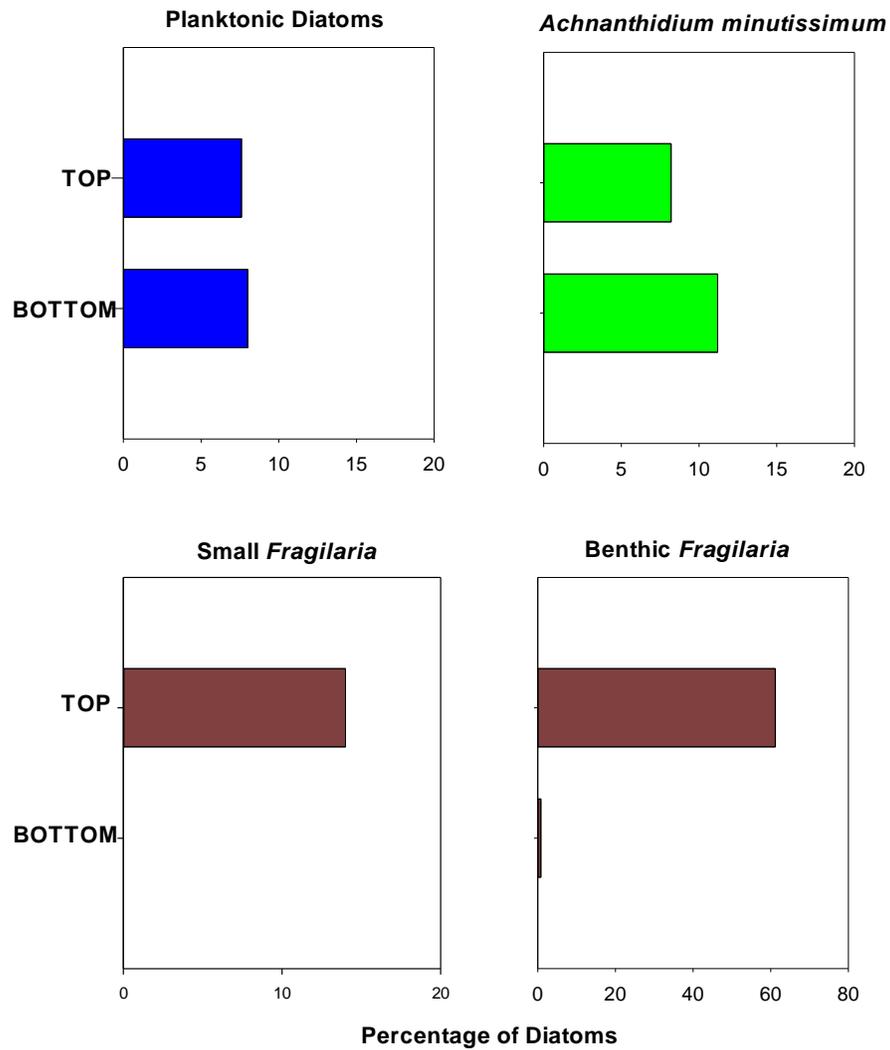
In recent years models have been developed that allow us to use the diatom community to estimate nutrient concentrations including phosphorus. A weighted averaging model was applied to the diatom community in the top and bottom samples of the Half Moon Lake sediment core. This model estimates the present day summer mean phosphorus concentration at 22 $\mu\text{g L}^{-1}$ and the historical concentration at 12 $\mu\text{g L}^{-1}$. Since the estimated concentration at the top is similar to values directly measured during the summer of 2012 I feel that the estimated historical concentration is reasonable. This means that summer phosphorus levels have increased significantly.

Table 1. Summer phosphorus concentrations estimated from the diatom community.

	Phosphorus ($\mu\text{g L}^{-1}$)
Top	22
Bottom	12

The above analysis assumes that the bottom sample represents pre-settlement conditions. This will not be confirmed until this fall when the radiochemical analysis is done.

HALF MOON LAKE Bayfield County



| **Figure 1.** Abundance of common diatoms in the Half Moon Lake sediment core. The greatest change was the large increase in benthic *Fragilaria* in the top sample. This indicates a large increase in filamentous algae which signals an increase in phosphorus levels.