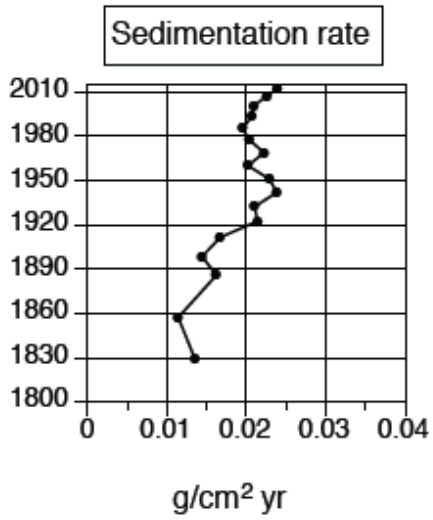
Bone Lake Sediment Core Study Summary

A sediment core was taken in the south Basin of Bone Lake in October of 2013. The core was analyzed to get a historical record of how much sediment has come in from the watershed and the water quality of the lake from the 1800s to the present day.

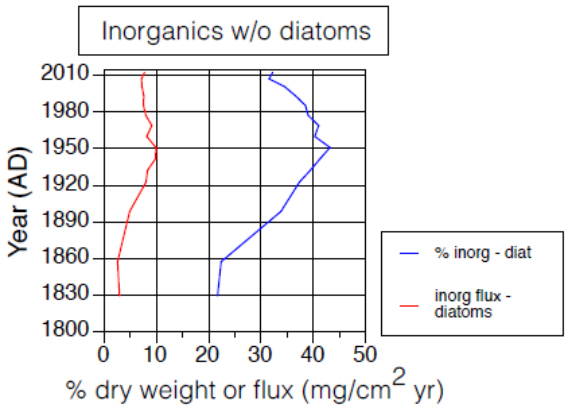
Analysis included:

- Dating the sample
- Sediment composition
- Algae productivity
- Diatom communities (a type algae)
- and types of sediment phosphorus

The dating was done using Lead-210(Pb-210) to know what dates are correlated with what depth. The sediment composition was determined through loss-on-ignition (samples brought to 1000°C) analysis. What this analysis shows is that sedimentation rates in Bone Lake have increased two fold since pre-European settlement of the area, and that the inorganic portion (soil) showed an increase after 1900. The inorganic increase is likely due to land use changes in the watershed.

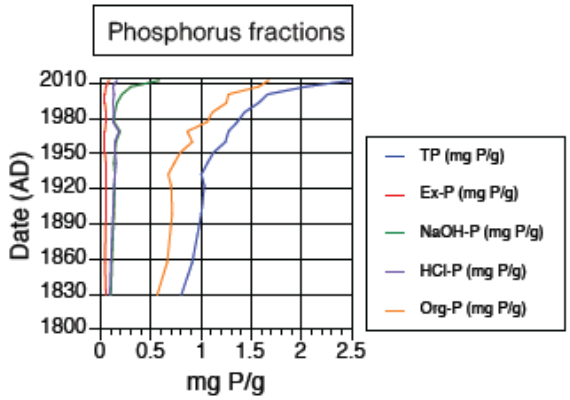


It appears as though the sedimentation rates are decreasing; likely due to management efforts of the district. Bone Lake produces a lot of diatoms. When the mass of diatoms is extracted from the total sediment weight a significant decrease in sedimntation can be seen, which of course is a good thing.

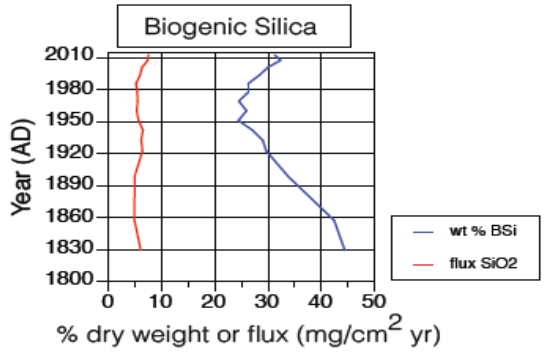


The concentration and accumulation of phosphorus in the sediment show general

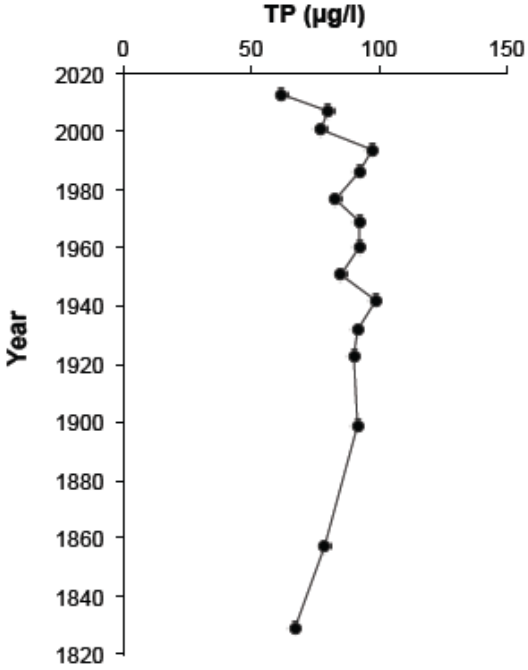
increases toward the top of the sediment core. The type of phosphorus that can be used by algae (NaOH-P, the green line) is mostly found in the top 4cm of the sediment. This has implications for the internal loading fueling algae blooms especially when the lake is mixed by wind, boat traffic, or lake turnover.



Algae productivity was analyzed using biogenic silica concentrations within the core. Biogenic silica (BiSi) is the element silica (Si) that is utilized by a type of algae called diatoms to make "shells". The BiSi shows the biggest peaks in the 1920s-1950s and the most recent decades.



The diatom community (a type of algae) was dominated by six species that are generally found in fairly productive lakes. A single significant shift occurred in the 1930'-1940's at a time when cottage and resort development was occuring around the lake and agricultural practices were changinig. This diatom community was used to 'reconstruct' the historical phosphorus of the lake. The estimates show peak levels in the 1940s and 1990s before dropping a bit since the mid 1990s. Reconstructed phosphorus for the past 10 years are similar to values collected by volunteers in late summer and fall, a period known for blue-green algae blooms.



The take home message from the sediment core analysis is two-fold: 1. We need to collect more data to get a handle on internal loading of phosphorus and make sure that other nutrients such as nitrogen are not fueling the system, and 2. Management efforts appear to be working reducing sediment.

Right now Bone Lake is walking the edge of a cliff. Continued management and monitoring will ensure is does not fall off the cliff. However, without management activities additional nutrient loading could send Bone Lake spiraling into a blue-green algae dominated state which is very difficult to manage if even possible.