Diatom Inferred Phosphorus Concentration in Horse Poop Dynamite Lake (Third Lake)

Introduction
Third Lake has nutrient problems. Phosphorus (P) levels in the lake water are high, which causes algae blooms. Diatoms are silica-celled algae. We are using diatoms as an indicator for phosphorus concentrations in Third Lake. Researchers from Fond du Lac Environmental suspect that the P is coming from human activities, specifically the horse farm on the shore of the lake. However, it is possible that the lake is just naturally rich in P. We proposed to help them answer the question of whether the P levels are natural or man-made by determining what P levels were in the natural lake, before European settlement approximately 250 years ago, and what P levels are today. High phosphorus concentrations in the water column can be related to lower water quality conditions.

Diatoms, a type of photosynthetic algae, live in the surface water of the lake. Different species of diatoms have different tolerances for different P levels. By looking at many, many lakes, sampling their living diatoms and measuring their P levels, researchers have learned these tolerances and can put them into a computer model that predicts P levels based on what diatoms are found. We can use this technique to look at fossil diatoms from ten, 50, or 1000 years ago to determine past P levels in a lake.

Methods
We identified and counted the diatoms on 2 slides using a standardized taxonomic key. Using a computer program (C2), we compared our data to a 89 lake training set using the Modern Analog Technique (MAT).

Results and Discussion
After we counted diatom valves we compared our diatom species assemblage data to a large lake training set using the modern analog technique (MAT). By identifying and counting the species of diatoms from the Third Lake core we were able to determine that the inferred total phosphorus of the lake went up by approximately 50% from 1750 to 2011. We cannot accurately conclude that the level total P was caused by the horse poop. There could be many other factors involved. Further research is needed to test soil biogeochemistry and local hydrological features.