What's in the muck? A benthic analysis of Song Lake

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Background

The benthic community of a lake is a diverse and nutrient laden environment. Typically, increased decaying organic matter supports more organisms than substrates void of nutrients (1). Song Lake, a privately owned kettle lake located in Tully, NY, was the area of study. The lake has no inlets or outlets so it is fed by surface runoff, groundwater, and precipitation (2). There is residential development all along the western shoreline and portions of the eastern shoreline.

The purpose of this study was to analyze the benthic community of Song Lake, including sediments, macrophytes, and invertebrates.

We predicted that there would be more organic matter at greater depths and at the southwestern side of the lake. The general relationship between depth vs. amount of organic matter was explored. The difference between amounts of organic matter comparing the more developed shoreline (west) vs. less developed (east) in the southern half of the lake was also looked at.

Methods

- Sediment samples were collected at 23 locations at various depths around the lake (Fig. 1) using a petite PONAR benthic grab (Fig. 2). Each sample was homogenized and 200ml of each sediment was placed in a tray to air dry for four days (Fig. 3).
- Air dried samples were crushed, sieved, heated to 105 °C for 24 hours, then burned at 470 °C for 15 hours (Fig. 4).
- Masses of each sample before and after burned were compared to calculate the percent organic sediment lost on ignition (3)(4).
- Eight samples were assessed for macroinvertebrates to examine the benthic macrobiota.
- Sample sites 12-15 were selected to represent the southwestern side of the lake (more housing) and 17-20 for the southeastern side, which has a larger riparian buffer.
- A student's T test was used (α=0.05) to determine if the difference between organic content lost on ignition was significantly different between the shorelines.

Figure 2 –PONAR (5)

Figure 3 - Substrate samples on air dry trays

Figure 4 -Breaking down substrate for oven

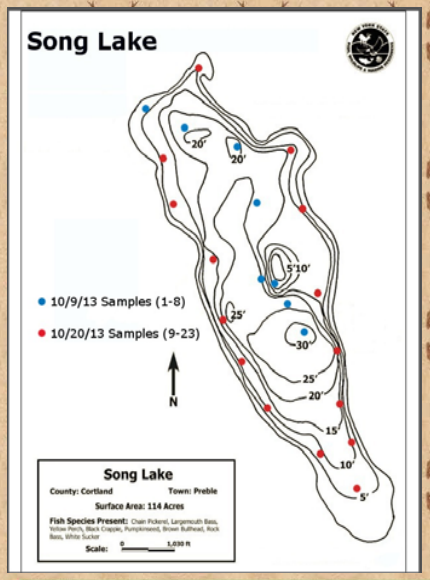

Figure 1 - Benthic sample sites & morphometry

Results

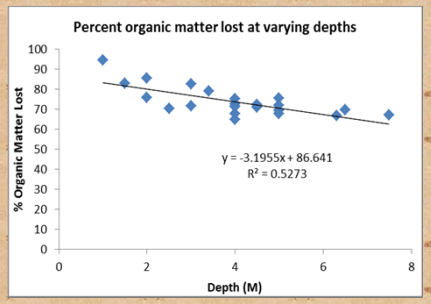

Figure 5 shows there was a decreased amount of organic matter at deeper depths within the lake trend (R^2=0.5273)

Average Organic Matter Lost on Ignition		P-Value
Sample Sites 12-15 (West)	69.16%	0.0085
Sample Sites 17-20 (East)	74.24%	

Table 1 used a 2 sided student t-test at α=0.05 that showed a significant difference between percent organic matter lost at sites 12-15 and sites 17-20.

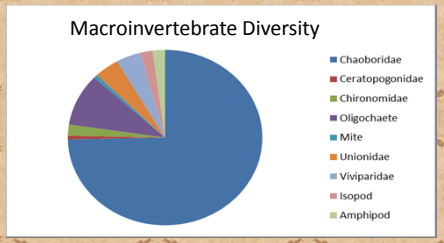

Figure 6 shows an overwhelming majority of Chaoboridae in samples taken from bags 1-8. They are common predators of varying types of zooplankton and are preyed upon by many kinds of fish. To the right is an image of a *Chaoborus sp.* (6)

Discussion

- The p value of 0.0085 is statistically significant showing a higher amount of decomposing organic material on the southeast end compared to the southwestern end.
- The southwestern end did not have more decaying organic material on average even though there are septic and sewage systems present
- Potential Explanation: High amounts of allochthonous input on the southeastern side, due to increased area of riparian buffer.
- The island in the lake may act as a wind buffer and decrease mixing of sediments
- Further chemical analysis of the samples could be done to determine nutrient loading and C:N ratios of decaying organic matter

References

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