

Analysis of Song Lake Monitoring Sites Based on Phosphorus Concentrations

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Introduction

Approximately 20 miles south of Syracuse in the Tully Valley lies Song Lake. The small kettle lake's characteristics are rare in that it has very few exotic species, and has species such as native *Myriophyllum* and native unionid that tend to be sparse throughout the rest of the region. Because Song Lake is a closed system, it only receives water inputs from precipitation, surface runoff, and groundwater. The lake has a strong association that in recent years has become concerned with the spread of invasive species, controlling macrophytes, and the potential threat of toxic algal blooms.

In the past, the Citizen Statewide Lake Assessment Program (CSLAP) has monitored the lake at one particular location. However, there are worries that the sampling site does not fully represent the lake as a whole. This study focuses primarily on phosphorus, a key nutrient in the success of phytoplankton growth. As a product of agricultural runoff, high concentrations of phosphorus can be responsible for eutrophication.

Objectives

To determine if the CSLAP monitoring site (Site 6) accurately represents the lake in regard to phosphorus levels or to make suggested sites that would be more representative of the lake as a whole. Based on prior knowledge, we would hypothesize that there would be significant difference in phosphorus levels in the lake.

Methods

- 20 evenly distributed sites were selected.
- A Van Dorn was used to collect water samples 1 meter below the surface.
- From each sample, 25 ml aliquots were treated with $K_2S_2O_8$.
- The samples were put into the autoclave, where the strong oxidant converts particulate and organic phosphorus into phosphate.
- Using the standard phosphorus method, a mixed reagent was added to the samples and let stand for 10 minutes.
- The absorbance was found using a spectrometer and phosphorus concentration was determined based on a standard curve.
- The values were interpolated in ArcGIS as well as analyzed with a Mann-Whitney Test to evaluate differences in phosphorus levels.



Results



Figure 1: Phosphorus levels interpolated using ArcGIS



Figure 2: Overall phosphorus concentrations by site

| Group | N | Median | 25% | 75% |
|-------|----|--------|-------|-------|
| South | 7 | 1.101 | 1.017 | 1.2 |
| North | 13 | 1.441 | 1.363 | 1.521 |

Figure 3: The difference in the median values between the two groups is greater than would be expected by chance therefore there is a statistically significant difference ($P < 0.001$) between the north and south sites.

Discussion

The measured phosphorus values were found to be lower in the southern sites (1-6, 8) compared to those that were in the north (7, 9-20). A statistical analysis was done using the Mann-Whitney Test that used the median values to confirm that there was indeed a significant difference among the north and south sites. Although Song Lake is considered to be a closed lake there are still currents due to the wind that blows from South to North. Our data is indicative of that process in which wind moves the water along with any dissolved nutrients towards the north end of the lake. It was also observed that sites 9 and 10 had relatively high phosphorus concentrations compared to the rest of the lake at $1.798 \mu\text{m/L}$ and $2.256 \mu\text{m/L}$ respectively. This can be explained due to the wind acting upon the lake channeling nutrients from the southern part of the lake to east of the island becoming accumulated in the bend of the lake.

Suggestions

- This general area (specifically Site 10) would be useful to monitor due to the overall increased concentration of phosphorus which can be used as an early warning sign of potential algal blooms.
- It is also recommended that 1 site from the north (site 16) and 1 site from the south end (site 2) of the lake be used to monitor the amount of phosphorus present in the lake to give the most accurate range of phosphorus levels in the lake.
- The CSLAP site (site 6) would not be sufficient to determine the overall phosphorus level of the lake although using it as a "south site" since it is the median value of the southern sites would suffice.
- It is our hope by monitoring these sites that the Song Lake Association will develop a better understanding of their lake and can detect any potential problems such as algal blooms before they become a nuisance to the lake as a whole.

References

1. Songlakewatershed.org
2. Limnology Practicum Lab Book

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