

Coastal Plain Pond Comparison: Introducing Inquiry into the Classroom

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Abstract

Ponds are vital components of the ecosystem, monitoring their health is an essential part of conservation management. Pond health can only be determined by many measurements of abiotic and biotic factors over time in a labor intensive manner. Using high school students to monitor pond health provides an opportunity for large scale data collection over years. While the data collected might not be 100% accurate, these are students after all, interesting trends and anomalies will be identified. Conservation groups will be able to focus their resources on 'red flag' issues that the students identified.

Introduction

Ponds are essential parts of the ecosystem, contributing to greatly to local biodiversity. Monitoring the health of ponds by sampling is an accepted method included in conservation policies. There are few published comprehensive scientific studies of pond health, in fact the very definition of what is a pond is debatable. One definition that appears useful defines ponds as "Water bodies between 1m² and 2 ha in area which may be permanent or seasonal, including both manmade and natural water bodies." Ponds, however still need to be placed in categories in which to study so that similar environments can be compared providing useful data. There are four pond categories proposed by FERN the Foundation for Environmental Research in the Northeast that need to be monitored. Conservation groups and the government do not have the available resources to monitor the great variety of ponds.

Introduction cont.

This project is an attempt to implement a protocol for monitoring Long Island Freshwater ponds, by using high school students from local districts as teams of data collectors and monitors. Many high schools are located close to freshwater ponds and have students, whether in environmental or research classes that need to learn practical data collection organization and analysis methods. Each year there will be students available to continue the data collection and the schools can warehouse the data by using programs such as Microsoft Access, Google Maps or Arc GIS from ESRI. Once the data has been collected and organized, trends may become apparent, and students' natural curiosity will promote research topics for further study. Interesting data trends will also be reported to local environmental monitoring groups for inquiry.

Ponds are an important ecological feature that needs monitoring over a long period of time. Environmental conservation groups do not have the resources to devote to such a study, high school students are available to sample and monitor ponds and can provide useful data.

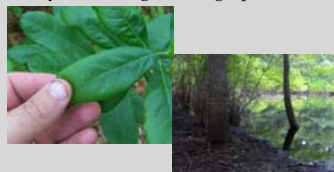
Data

Sample ID	DUCS	DUC(Mean)	Temp	pH	Cond.	Turbidity	Nitrate	Ca	Est Hardness	Chloride	Salinity ppt	Est. Alkalinity
BNL Pond 1												
Date	7/26/2010											
P-1a	63.61	5.540	22.370	4.10	39.000	19.800	1.400	13.500	50.625	9.400	0.017	266.636
P-1b	27.26	2.230	23.570	4.10	39.000	48.400	0.700	5.900	22.125	5.900	0.011	307.136
P-1c	54.04	4.540	24.140	4.10	39.000	36.100	1.200	6.400	21.500	7.700	0.014	300.145
Mean	48.3003	4.103	23.360	4.107	39.000	34.767	1.067	5.267	24.750	7.667	0.014	271.312
Variance	255.073	2.771	0.976	0.000	0.000	205.623	0.130	15.003	210.594	3.052	0.000	100.603
SD	16.0418	1.665	0.988	0.000	0.000	14.347	0.361	3.873	14.525	1.750	0.003	10.421
SE	10.0702	0.361	0.522	0.000	0.000	8.202	0.209	2.226	8.206	1.071	0.002	6.077
BNL Pond 2												
Date	7/26/2010											
P-2a	34.04	7.9	24.05	4.19	38	151			0.000		0.000	344.612
P-2b	109.02	14.01	25.15	4.16	35.5	23.0			0.000		0.000	321.071
P-2c	184.38	15.21	25.17	4.11	38	29			0.000		0.000	288.636
Mean	109.407	12.373	24.750	4.153	36.500	67.933			0.000		0.000	317.620
Variance	2581.95	15.368	0.441	0.002	1.752	6781.033			0.000		0.000	882.281
SD	40.4069	3.920	0.661	0.040	1.323	82.395			0.000		0.000	29.704
SE	27.9997	2.263	0.370	0.023	0.764	41.1997			0.000		0.000	16.955

Methods

Water Quality Testing

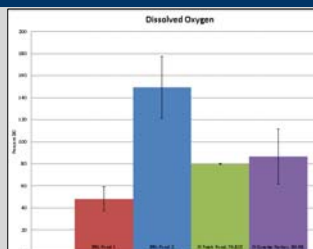
- A YSI meter was used to measure water temperature, pH, dissolved oxygen and conductivity at 3 locations within the pond.
- Water samples were collected at an arm's length depth for further analysis using Vernier Data Probes.
- Vernier Data Probes were used in a laboratory setting to test Nitrate, Calcium, Ammonium, and Chloride Levels in addition to testing the turbidity.
- Microsoft Excel was used for mathematical calculations, statistical analysis and to generate graphs.



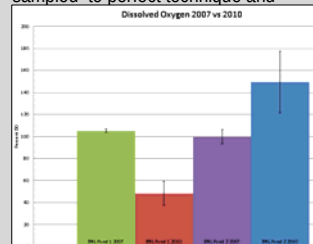
Biodiversity Sampling

- Seining was performed and invertebrates were photographed for identification.
- Plant species were surveyed by walking the perimeter and photographing each organism for further identification using Sibley's Tree Identification.

Results

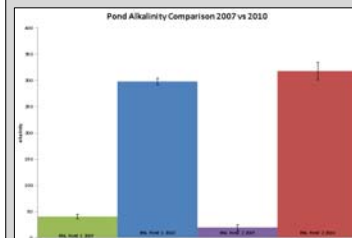


Additional bodies of water were sampled to perfect technique and



Data was compared with previous research from the same ponds.

Results and Discussion



The data collected is not trustworthy. For instance, examine the graph above comparing alkalinity for BNL Ponds 1 and 2 from 2007 through today. Alkalinity is a valuable measurement in pond health as it indicates how well a pond will respond to the addition of acids and bases. The above graph implies that alkalinity has increased dramatically over the past three years to very robust levels. While this is possible, it is very unlikely. More likely is that our techniques need refining.

This project involved a tremendous amount of data collection over a short period of time. The protocols used must be repeated, and perfected.

However, once a standard protocol is in place and the methods are perfected, while there might be errors in the quantitative data, the comparisons and trends will be valuable.

Conclusion

No valid conclusions can be made from the data collected. However pond health can not be assessed with one set of data collection like taking one's temperature. With practice the methods followed here will provide valuable data over the long term about the health of the local pond ecosystems.

In addition, high school students did help with some of the data collection; their enthusiasm and curiosity inspires confidence that they will prove a valuable resource in the future.

Acknowledgements

- Thank you Jennifer Higbie and Mel Morris for all of your assistance.

