Characterizing the Mineral and Biological Content of Local Bodies of Water

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Abstract. My project consists of testing different bodies of water on Long Island. The purpose of this experiment is to investigate the relationship between population concentration and water pollution. Because my uncle is a geologist with his own business in Orlando, Florida, I was able to inquire what he does when he tests water samples in various areas. He is testing to see if the water is fit for human cultivation. My challenge is trying to figure out if the human population concentration affects the pollution level. I believe that the bodies of water that have greater surrounding human populations will be the most polluted. The tests I conducted on my samples were the: Biochemical Oxygen Demand, Nitrate, Phosphate, pH, and Dissolved Oxygen. The focus of these experiments was to find the bacteria and nutrient levels of my water samples. The data shows that there was low level of nutrients, but no signs of harmful bacteria. My microscope results showed that there was no activity in my water samples. Therefore, the various bodies of water I tested on Long Island are relatively free of pollution.

Keywords: Nitrate (NO3), Phosphate, Dissolved oxygen, pH, and Biochemical Oxygen Demand

INTRODUCTION

Ponds, lakes and streams are used to collect water runoff from roads. Does a greater human population concentration cause greater pollution? It is my belief that bodies of water in close proximity to greater population will be more polluted. What prompted me to start my project is that I knew that my uncle's job had something to do with testing different types of water samples. I thought he would be able to help me with some questions I had about my project and he did. I hope to show that the water samples I have collected are filled with nutrients and have no bacteria in them. Maybe Long Island can be marked as having clean and nutrient-rich lakes and ponds.

METHODS

Water Sample Information

MASSAPEQAU PRESERVE LAKE is a freshwater lake and was formed from groundwater. This lake is all natural and gets no water from outside streams.

LAKE MONTAUK was a freshwater lake before 1925, when it was the largest lake in Long Island at over 1,000 acres. After 1925, jetties were put on both sides of the lake which made water flow in and out of Lake Montauk. Now Lake Montauk is a saltwater lake because it mixed with water from the Block Island Sound. The water flows through jetties which control the water flowing in and out of Lake Montauk. Lake Montauk also gets its water from the ground, Peter's Run, Stepping Stone Pond, and other little streams.

GEORGICA POND is now a saltwater pond which used to be a freshwater pond until its gates would open up to let water flow in twice a year. It also gets the runoff from roads, culverts which are big pipes that hold water, rain and snow, and groundwater.

BELMONT LAKE is a freshwater lake which gets its water from groundwater and rain and snow.

MILL POND is a freshwater lake which gets its water from groundwater and glacial spring aquifer seeds which flow into the stream and enters forest lakes. Mill Pond also flows underneath Sunrise Highway and into a nearby bay.

The ATLANTIC INLET is a freshwater and saltwater mixing inlet which flows into the Atlantic Ocean.

BROOKSIDE BROOK is a freshwater stream located in the Brookside Preserve flows under the Freeport High School and connects to Milburn Pond which eventually flows into the Atlantic Ocean.

RAINWATER is the water I collected from rain outside my house.

HEMPSTEAD LAKE is a freshwater lake which gets its water from the ground and from snow and rain. It is apart of Hempstead State Park.

I also got water from fish tanks in my classroom.

Dissolved Oxygen Procedure

1. Measure and pour the first water sample (Mill Pond) into the test tube and record the temperature.
2. Drop two Dissolved Oxygen TesTabs into the tube, screw on the cap and shake until the tablets have dissolved.
3. Wait approximately five minutes for the color to develop.
4. Compare the color of the sample to the Dissolved Oxygen color chart and record results.
5. Repeat this procedure with the remaining eight water samples. (Georgica Pond, Hempstead lake, Lake Montauk, Brookside Brook, Atlantic Inlet, Belmont lake, Massapequa lake, rain water)

BOD Procedure

1. Measure and pour the first water sample (Georgica Pond) into the test tube. Place on the cap.
2. Cover the test tube in aluminum foil and store in a dark place at room temperature for five days.
3. After five days, unwrap the tube and add two Dissolved Oxygen TesTabs into the tube.
4. Replace the cap, make sure there are no air bubbles, and shake the tube until the tablets have dissolved.
5. Compare the color of the sample to the Dissolved Oxygen color chart and record results.
6. Repeat this procedure for the remaining eight water samples. (Mill Pond, Hempstead lake, Lake Montauk, Brookside Brook, Atlantic Inlet, Belmont lake, Massapequa lake, rain water)

Nitrate Procedure

1. Measure and pour the first water sample (Brookside Brook) into the test tube.
2. Add one Nitrate Wide Range CTA TesTab into the tube, place the cap on, and shake until the tablets have dissolved.
3. Wait approximately five minutes for a color change.
4. Compare the results to the Nitrate color chart and record results.
5. Repeat this procedure with the eight remaining water samples. (Mill Pond, Hempstead lake, Lake Montauk, Georgica Pond, Atlantic Inlet, Belmont lake, Massapequa lake, rain water)

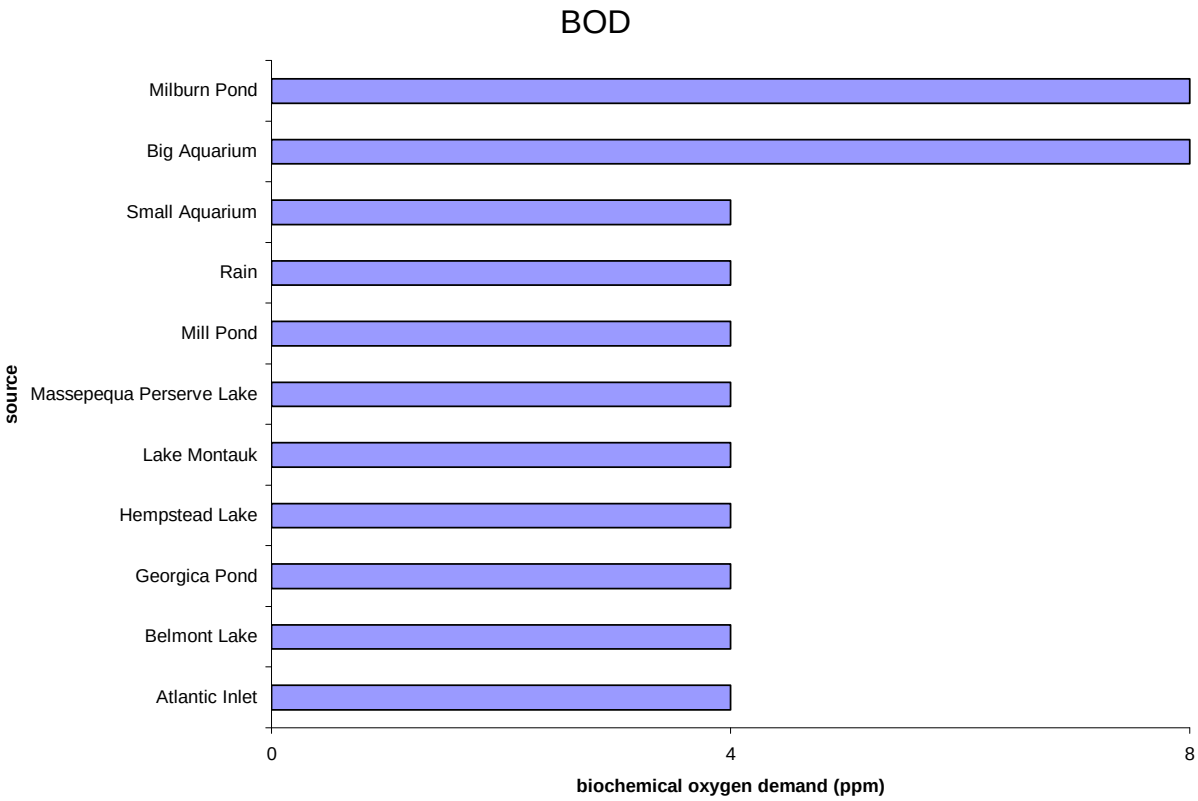
pH Procedure

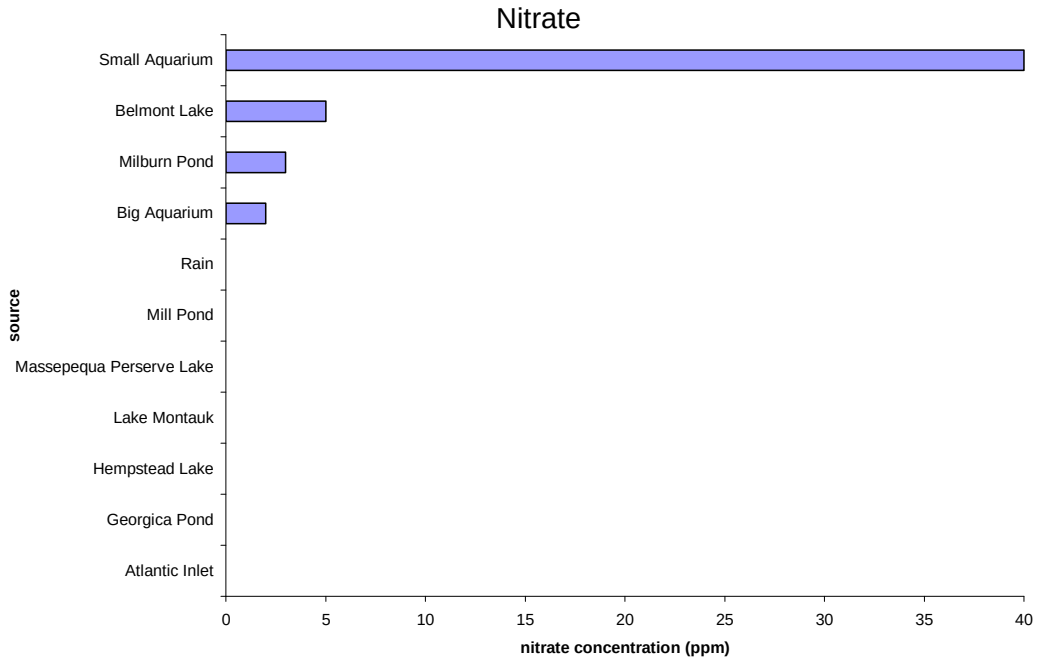
1. Measure and pour the first water sample (Atlantic Inlet) into the test tube.
2. Add one pH Wide Range TesTab, replace the cap, and shake until the tablet is dissolved.
3. Compare the color of the sample to the pH color chart and record the results.
4. Repeat this procedure with the remaining eight water samples. (Mill Pond, Hempstead lake, Lake Montauk, Georgica Pond, Brookside Brook, Belmont lake, Massapequa lake, rain water)

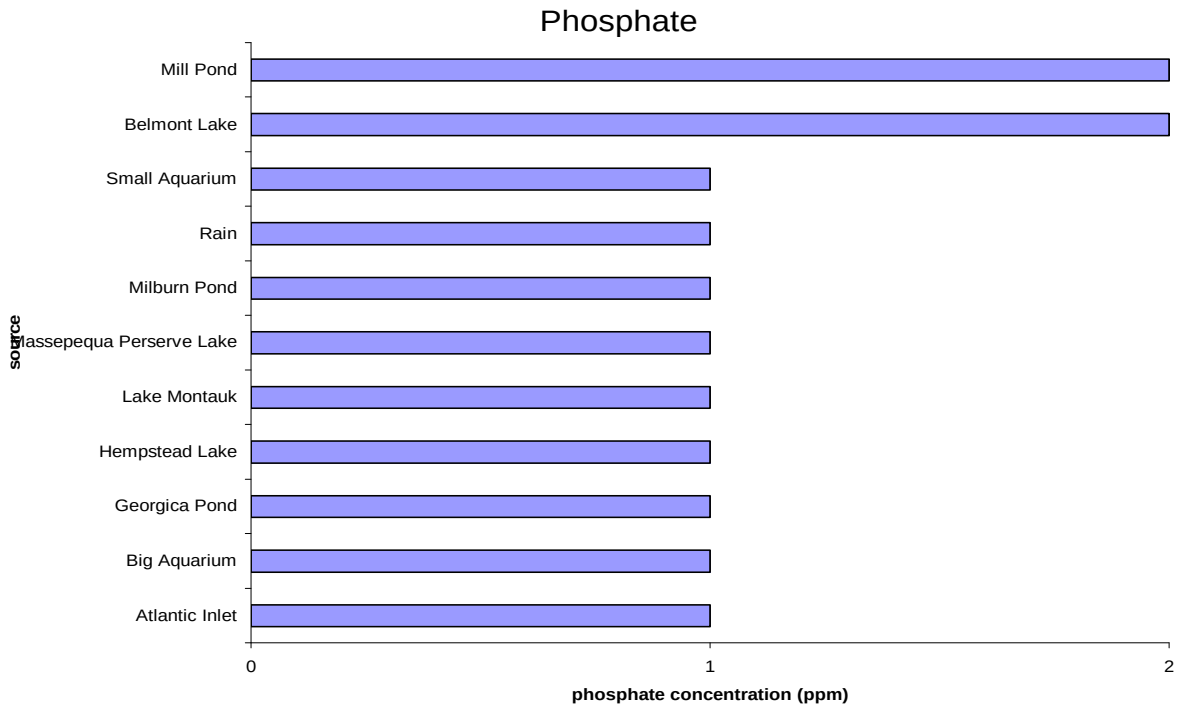
Phosphate Procedure

1. Measure and pour the first water sample (Belmont Lake) into the test tube.
2. Add one Phosphorus TesTab, replace the cap, and shake until the tablets have dissolved.
3. Wait approximately five minutes for the blue color to develop. (If there is no blue color, record the sample as 0ppm.)
4. Compare the color of the sample to the Phosphate color chart and record the results.
5. Repeat this procedure with the remaining eight water samples. (Mill Pond, Hempstead lake, Lake Montauk, Georgica Pond, Brookside Brook, Atlantic Inlet, Massapequa lake, rain water)

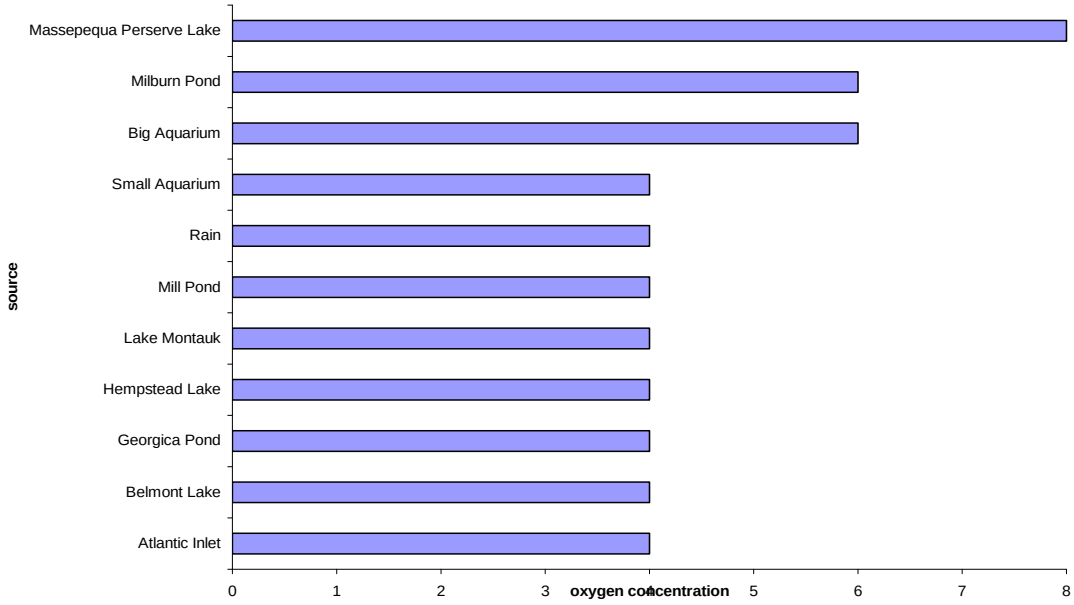
*All TesTabs are from the La Motte Water Monitoring Kit


BOD
Milburn Pond
Big Aquarium
Small Aquarium
Rain
Mill Pond
Massepequa Perserve Lake
Lake Montauk
Hempstead Lake
Georgica Pond
Belmont Lake
Atlantic Inlet
source
0
4
8
biochemical oxygen demand (ppm)

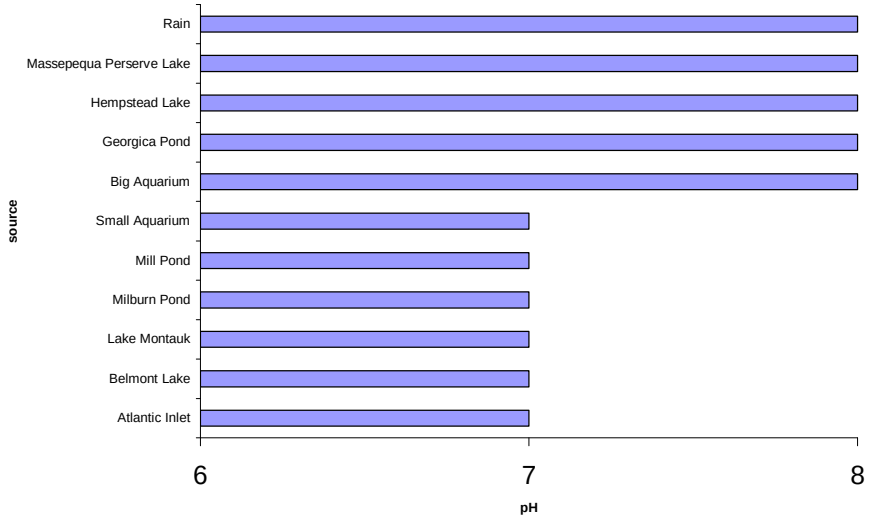

Nitrate
Small Aquarium
Belmont Lake
Milburn Pond
Big Aquarium
Rain
Mill Pond
Massepequa Perserve Lake
Lake Montauk
Hempstead Lake
Georgica Pond
Atlantic Inlet
source
0
5
10
15
20
25
30
35
40
nitrate concentration (ppm)


Phosphate
Mill Pond
Belmont Lake
Small Aquarium
Rain
Milburn Pond
Massepequa Perserve Lake
Lake Montauk
Hempstead Lake
Georgica Pond
Big Aquarium
Atlantic Inlet
source
0
1
2
phosphate concentration (ppm)

Dissolved Oxygen



pH



RESULTS

Nitrate

The nitrate chart showed that the small aquarium was filled with many feces. The feces are filled with nitrates so that's why it came up so high compared to all my other water samples. Nitrate (NO_3^-) is a water-soluble molecule made up of nitrogen and oxygen. It is formed when nitrogen from ammonia or other sources combines with oxygenated water. Nitrate is a natural constituent of plants and is found in vegetables at varying levels depending on the amount of fertilizer applied and on other growing conditions.

pH

Every sample was either neutral or slightly basic when tested. A pH (potential of Hydrogen) measurement reveals if a solution is acidic or alkaline (also base or basic). If the solution has an equal amount of acidic and alkaline molecules, the pH is considered neutral. Very soft water is commonly acidic, while very hard water is commonly alkaline, though unusual circumstances can result in exceptions.

The pH scale is logarithmic and runs from 0.0 to 14.0 with 7.0 being neutral. Readings less than 7.0 indicate acidic solutions, while higher readings indicate alkaline or base solutions. Some extreme substances can score lower than 0 or greater than 14, but most fall within the scale.

Phosphate

In every sample, there was relatively no phosphate. Phosphate is a salt or ester phosphoric acid.

DISCUSSION

I compared the results of my project to an article in 1989 by Beristain about the Long Island Sound. The article said that there was a lot of runoff that goes into the Long Island Sound. When the runoff comes from underground it picks up litter, soil, pesticides, wastes, and fertilizers. Since the ponds and lakes where I got my water from are not as grand as the Long Island Sound, I do not think all these types of pollutants would get into them. Therefore, I came to my conclusion being that the Long Island Sound is a lot more polluted than my water samples.

If I were to continue with this project I would have tested the water from different seasons of the year to see what different chemicals are collected in the water. I really wanted to get water from the Central Park Pond, but it froze. I would also collect less water samples, but conduct more experiments on the water samples such as the: sodium, conductivity and nitrogen levels. In the end I was very pleased to see that the water samples I collected were clean.

CONCLUSIONS

My hypothesis for this experiment was that the bodies of water in close proximity to greater population will be more polluted. In my results I saw that my hypothesis was correct. (See charts and graphs for results.) The two largest towns where I collected water from, Babylon and Hempstead were two of the towns that had the least amount of nutrients in their lakes and ponds. Every town's population from least to greatest according to the 2000 Census is: Montauk with 3,851 citizens, East Hampton with 19,719 citizens, Massapequa with 22,652 citizens, Valley Stream with 36,368 citizens, Freeport with 43,783 citizens, Hempstead with 56,554 citizens, and Babylon with 211,792 citizens. The result of my experiment shows that I should have used less water samples, but should have conducted the experiment over a longer period of time.

ACKNOWLEDGMENTS

A person I would like to recognize for helping me get my project started is my uncle, Patrick Barnes, a geologist from Orlando, Florida who helped me to understand how to find out what my control group would be. He told me that the control group is the group the lake(s) or pond(s) that get its water from rain, snow and the natural resources surrounding it. He said the control group, more often than not, would be lakes state or national parks because they have natural land around them. Runoff from cities or towns is not likely because there are not gates they can get through. He really got me started on my project so I would like to thank him.

Two departments that produced information about the water samples I collected were the Suffolk County Department of Environmental Conservation and the Nassau County Department of Natural Resources.

The Suffolk County DEC told me information on all of my Suffolk County lakes and ponds including Lake Montauk, Georgica Pond in East Hampton and Belmont Lake in Babylon. The Nassau County DNR told me information about my Nassau County lakes and ponds: Atlantic Inlet in Freeport, Brookside Brook in Freeport, Massapequa Lake, Mill Pond in Valley Stream, and Hempstead Lake. I credit all my knowledge about my water samples to these departments.

I would also like to acknowledge Mr. Doyle, my science teacher from getting me Lake Montauk, Georgica Pond and Mill Pond water samples. I would most like to show appreciation to my sister who helped me displaying my board and printing my pictures. Also, Dawn Birch who showed me how to make a graph, my mom who helped me cut out the report and fit it on the display board. Finally, I would like to thank my father who took me out to the sites of where most of my water samples had came from.

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