Report Template

The Change in the Ottawa River

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Abstract

If the Ottawa River is cleaner, the water will have a higher dissolved oxygen concentration and a pH of around 7 because fewer chemicals harm these processes. Our project is to collect data to see how the river is changing. We collected data on the Ottawa River for four days. We used pH sticks to measure the pH to see if there was pollution because pollution affects the pH level of bodies of water. Then we use a dissolved oxygen kit to collect the dissolved oxygen to see if fish could thrive in our river. From our data, we can infer that the river is improving when compared to historical data. We found out that the river changes rapidly. It can change vastly by day, location, and weather. In conclusion, we infer that the Ottawa River is improving, but it is hard to tell with the rapid changes in the river. If we were to do this again, we would collect more data to hopefully see a pattern.

Introduction

As a Boy Scout, I spend a ton of time in nature. Seeing more nature and bodies of water, we wonder how this changes. So we took that question and applied it to the local river. How does the water in the Ottawa River change with time? If the water got cleaner, with less pollution, then the pH would stabilize around a seven, there would be no drastic changes in the water temperature, and the water should have a high dissolved oxygen level because as the pollution levels drop, it would allow for the ecosystem to rebalance the water. Water quality is an important factor to monitor in all rivers, but most importantly in your local rivers, because if these rivers get polluted, it can be dangerous to people living around them and the reservoirs connected to them. When testing the water in the Ottawa River, if the quality of water drops, then people should start conservation efforts to save the local fauna and flora that rely upon the river to survive and put forth efforts to reverse the damages done to the river.

Using past historical data on the Ottawa River, we will determine if our local river is cleaning up or is worsening in condition. The criteria we are using for this are the pH of the water, dissolved oxygen, and lastly temperature. The use of pH in this is to tell us if the river is getting more basic or acidic, which is measured on a scale of zero to fourteen. With the river being too high on either side of the spectrum, it can lead to dangers in drinking the water. This would result in the local wildlife, like plants and animals, moving to different areas or dying. The second way of telling if a river is healthy is the dissolved oxygen content. If there is no or low dissolved oxygen, the body of water can "die". Water with low to no dissolved oxygen can not propagate life within the water. The final criterion we are looking at is temperature. We are looking for dramatic spikes and valleys in the water's temperature. These can indicate that the water is heavily polluted, dropping the water's specific heat. The criteria that are being used will show any changes that can be deemed dangerous to the wildlife in the area. We have done all of these tests to get a good grasp on whether our river is polluted or not. The idea for all of these tests and results is so future generations can use them. This will help with any future projects regarding the Ottawa River.

Methods and Materials

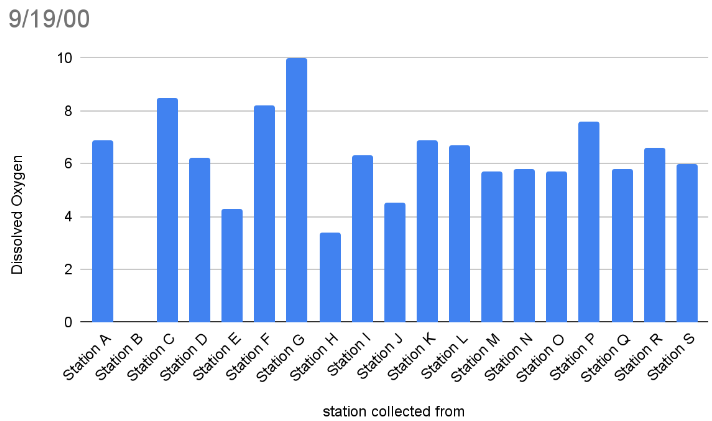
The procedure that we used was simple yet comprehensive. The first thing we did was we took prerequisite data. This data wouldn't change. This includes the river, the bedrock, can you see the bottom, the bank material, and finally the state of water. The next thing we did was take a sample of water in a beaker from the bucket of river water Dr. Kreischer-Gajewicz brought into class. The first thing we tested was the temperature of the water. For this we used the same Flinn Scientific INC. thermometer to take the temperature with the same percent error, if there was any, to keep consistent data. The next test we did was pH, the potential of hydrogen, in which we took a strip of Hydrion 5.5 - 8.0 pH to dip into the water. After dipping the strip into the water, we let it sit on the counter for a minute to get an accurate reading. After said minute had passed, we would compare the color of the strip to the colors on the packaging to get our reading. There could have been a slight error in this step due to just comparing the colors of two papers, but we made sure to get multiple eyes on it to limit this error. The last test we did was dissolved oxygen, which was performed with a CHEMets dissolved oxygen kit. What we would do is fill a special type of beaker with indentations in the bottom to break vials with 50 mL of water. Then we would take a vial from the kit and put the tip into the indentation on the bottom of the container. Following that, we would snap the tip of the vial, filling it with water. When it was filled, we would gently tilt the vial back and forth to mix the chemicals in the vial with the water to get an accurate reading. After mixing, we let the mixture sit for a minute, then take the reading by comparing it to the colored vials in the kit. There could have been a little error in this step. Like the pH, we had multiple eyes to compare the color to get the most accurate reading we could. Once the tests were over, we took the extra river water and dumped it down the drain. The water in the special beaker we took to the metal trash can to make sure that no chemicals or glass went into the drain. The used pH strip and glass vial also went into the metal trash can. After the materials were put away, we would clean the station we used and wash our hands to make sure there were no residue chemicals left on our hands.

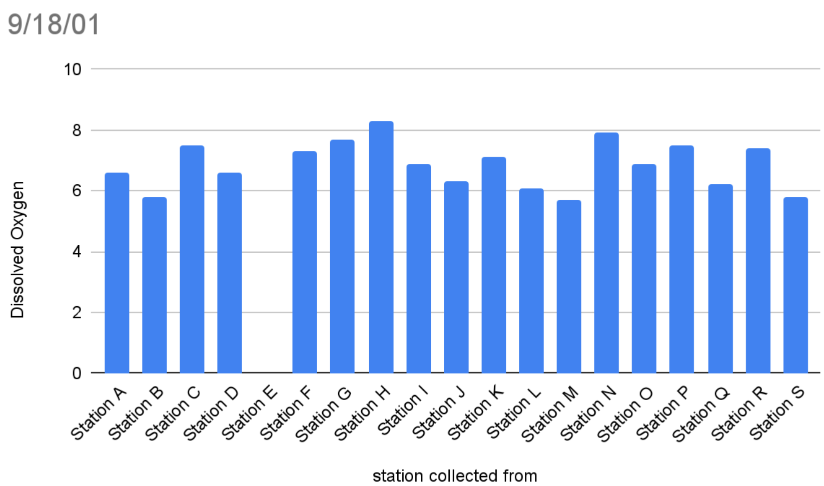
- We used pH sticks, Hydrion 5.5-8.0 pH
- A thermometer, Flinn Scientific INC.
- Dissolved oxygen kit CHEMets kit
- Beaker
- Bucket with a rope
- River water

Presentation of Data and Results

In the few tests we did, we found that we didn't collect enough data to make a confident statement about the data. We would like to collect more data to describe our river accurately. With the data collected, we could predict how we think the results will turn out, but any statement would have a low confidence rating. We have found that dissolved oxygen is one of many things that we need to build on, but with the comparison between our data and the historical data, we have found that the dissolved oxygen in the river sits at ~ 6.6. The change between the two graphs shows that the river is evening out with fewer peaks and outlying points. With that, the average dissolved oxygen also increases from 6.3 to 6.8, which is minor but shows that there is a recovery of life near the river. But even with the presence of more dissolved oxygen, it took over a year to raise .5 mg/L, which is not great. Our data has found a more profound change in the river's dissolved oxygen of 3.5 mg/L in only 28 days. This indicates that there is more flora near the river. This is a very important change that has happened because it means there's more oxygen in the river for animals to use. Other important elements are needed to keep a stable environment like pH. The pH of a river is a very important thing to life that depends on the river. The historical data has shown that the river used to sit around a pH of ~8.5, which is considered basic. This would even peak around 9. The pH of the river has dropped in the following years, leaving the river at a pH of ~6.65, which is considered more acidic. Usually, most aquatic animals prefer a pH of around 6.5-8.0, which is most habitable for life (source the college). This shows that the river has gotten more hydrogen from the environment and sits at a level where animals can live in it.

Dissolved Oxygen Graphs


9/19/00
Dissolved Oxygen
10
8
6
4
2
0
Station A
Station B
Station C
Station D
Station E
Station F
Station G
Station H
Station I
Station J
Station K
Station L
Station M
Station N
Station O
Station P
Station Q
Station R
Station S
station collected from


9/18/01
Dissolved Oxygen
10
8
6
4
2
0
Station A
Station B
Station C
Station D
Station E
Station F
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Station I
Station J
Station K
Station L
Station M
Station N
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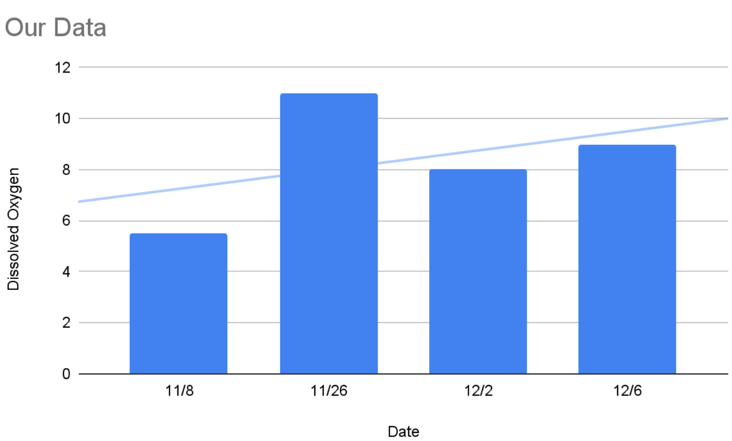
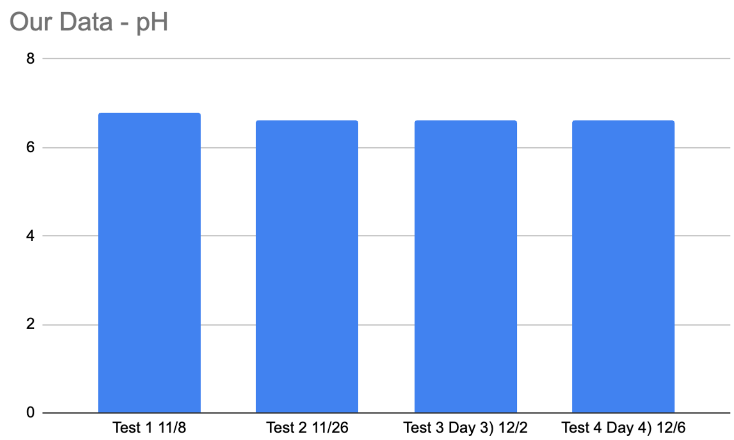
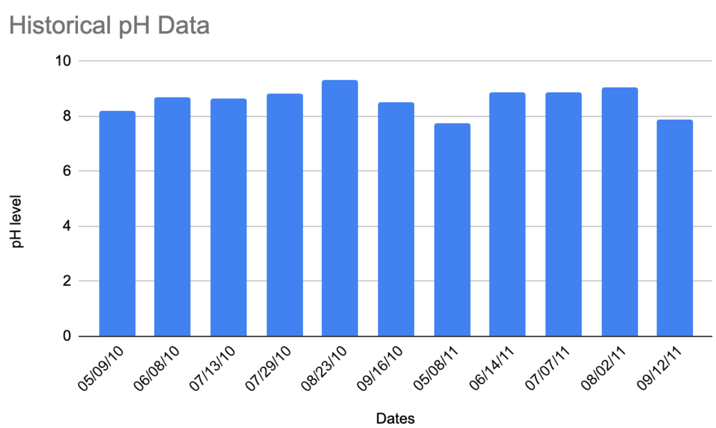
Station S
station collected from


Our Data
Dissolved Oxygen
12
10
8
6
4
2
0
11/8
11/26
12/2
12/6
Date

pH Graph





Analysis and Results

The results from the data collected suggest that the local water within the Ottawa River is improving. Now this supports our hypothesis, but not in every way we thought. We thought if the water got cleaner, then the pH would stabilize at 7, the dissolved solids would rise, and the temperature would stabilize with no drastic changes. The theory about the pH was wrong. The pH lowered to 6.5 to a more acidic environment for the life that depends on the river. While we were wrong about pH, we were right about the dissolved oxygen, which shows a more dramatic change in the oxygen in the river. The temperature was null because most temperatures are affected by the effect of the season, then by the cleanliness of the river. One of the math equations we use to analyze our data is the average. We did this to present a singular answer from several data points. This was done by taking all the data points, and then dividing by the number of points there are. One error that could have occurred in this experiment is that the data wasn't taken at regular intervals. Another point of error could have been that the water could have changed the temperature in the beaker or have been taken from random spots. Something that we could have done differently to improve it is to keep the process more controlled. This could have skewed our results, which could have helped support our hypothesis.

Conclusion

The condition of the river has improved from what we could tell from the data we collected so far. We have concluded that the improvement of the pH and the level of dissolved oxygen, are both massive factors that are needed for life in the river. The data that we have, though, is lacking in depth compared to the data we are comparing it to. This is why we need to continue our research to get a better understanding of the river as a whole instead of just the little we have now. Yet we still have tried to present an answer to our hypothesis about the river. The hypothesis was supported since the dissolved oxygen increased and the pH followed the trend that we thought, but ended up not exactly as we thought it would. The average of the data concludes that the river's water is improving.

Discussion

The importance of having a clean river is immense due to the repercussions it can have on the local environment and wildlife that depend on the river and its water. If the project was repeated, the scientist should focus on collecting more data at a steady interval. They should also collect data from several different locations in the river to provide a larger test sample to get more accurate data. This is more than a test in a classroom setting that helps show and represent the quality of the river that gets relayed on by the local plants and animals. These tests have an even greater impact on large bodies of water, which are vital to not just animals and plants, but to humans too. The water in the Great Lakes needs to be monitored to see if they're safe for people to be in or even near. One local and teacher of Ottawa Hills High School stated “The Ottawa River was so polluted that you could be near, let alone be in it. There were even signs to warn against it.” This river, which goes through an urban environment, could be proved unsafe and even dangerous, but you can only ever know it is tested and monitored. The use of a longer more complex and extensive data collection about the river can be a vital source of information even if it is taken in a classroom setting.

Acknowledgments

- Dr. Gloria Kreischer- Gajewicz
- Sara Mierzwiak

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