Comparing Water Quality at Different Locations in the Maumee Watershed

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Introduction

My science fair project is on testing water quality in different locations in the Maumee Watershed. These locations are Cairl Creek, Wolf Creek, Swan Creek, and the Maumee River. I chose this topic as my father has always told me, since I was younger, that the creek in our backyard (Cairl Creek) leads to the Maumee. This has stuck with me and when it came time for this project I chose to test the water quality in these different spots. It is important because I now know the importance of the water that runs through my backyard. It provides for the many fish that are living in the Maumee and also pastimes for the water loving people surrounding the Maumee.

Background Information

- Measurements: I took measurements of the water
- Mathematics: I analyzed the data
- Background Research: I did background research before I started taking measurements

Research Question

My research question is that I am going to test the water quality in Cairl Creek, Wolf Creek, Swan Creek, and the Maumee River.

Hypothesis

My hypothesis is that the water quality will worsen as we move further down the Maumee Watershed. This is my hypothesis, as water quality usually is not as good the more populated an area is.

Experimental Design

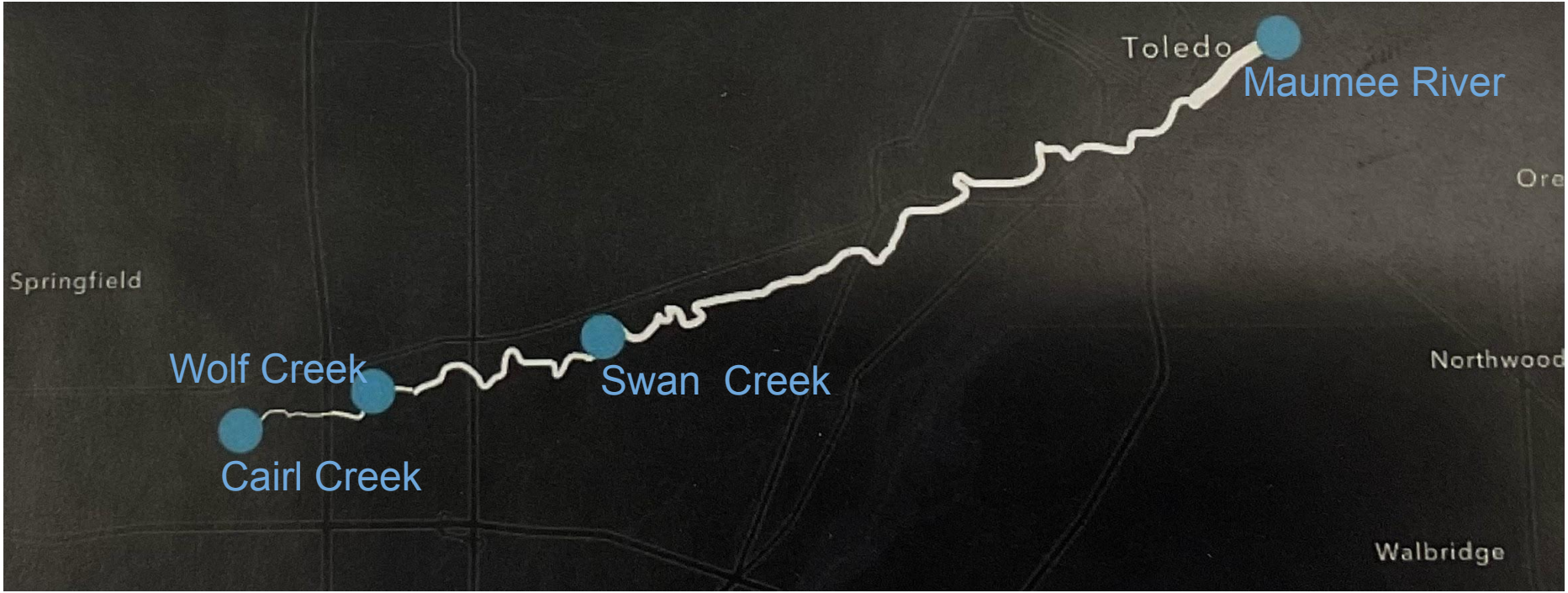
- **Independent variable:** where I test the water and when I test the water
- **Dependent variable:** the amount of dissolved oxygen, nitrates, nitrites, pH, and hardness in the water
- **Constant factors:** the location and the test methods
- Repeated 3 times

Materials

- pH probe
- Bucket
- Thermometer
- Dissolved oxygen ampoule test kit
- Phosphorus ampoule test kit
- Strip test

Methods

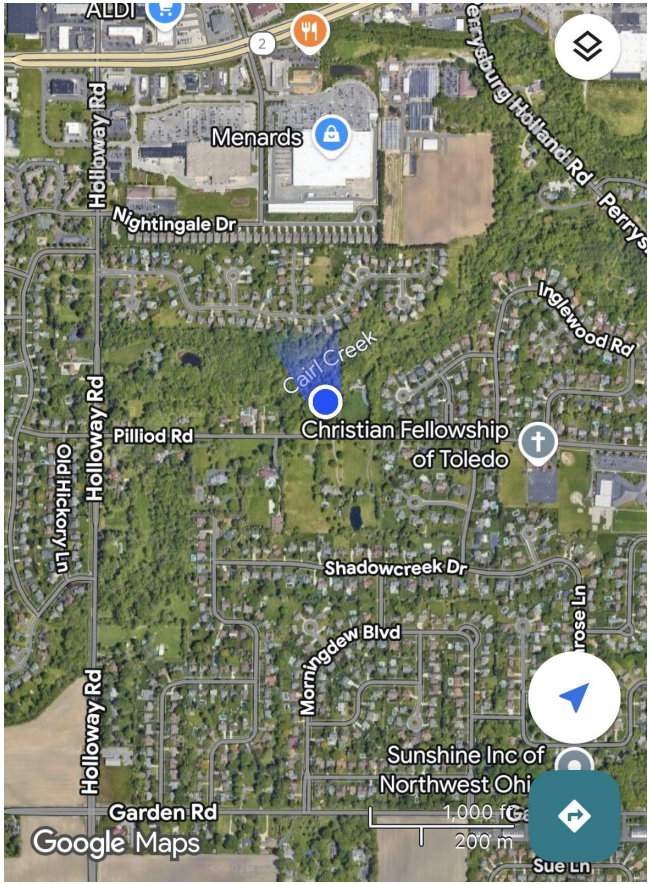
1. I put water in my bucket without causing a major stir in the water
2. I then take the temperature with a thermometer
3. Then the pH with the probe
4. I then take the dissolved oxygen ampule test
5. I proceed to take the phosphorus ampule test
6. Finally I take the nitrates strip test that also includes the hardness, and nitrites



Watershed Testing Locations

Results: Cairl Creek

Cairl Creek	Temperature	pH	Nitrite	Nitrate	Hardness	Phosphates	Dissolved Oxygen
Test 1	47°F	7.12	0	0	250	0.9	3
Test 2	44°F	6	0	0	300	0.4	4
Test 3	34°F	8.38	0	0	250	0.4	11

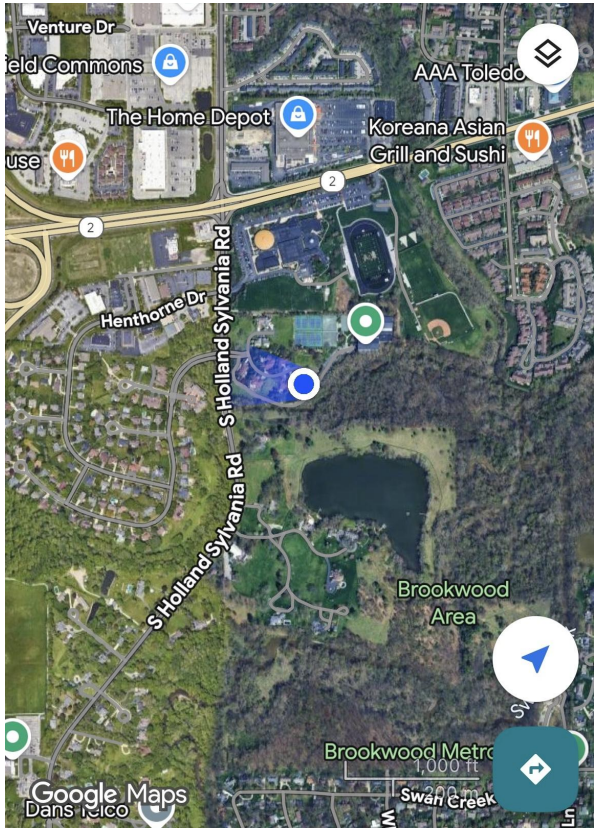


Cairl Creek

Photo credit: Reagan Anderson, Map credit: Google Maps

Results: Wolf Creek

Wolf Creek	Temperature	pH	Nitrite	Nitrate	Hardness	Phosphates	Dissolved Oxygen
Test 1	48°F	7.9	0	0	250	0	9
Test 2	46°F	6	0	0	300	0.2	6
Test 3	35°F	8.02	0	0	300	0	12

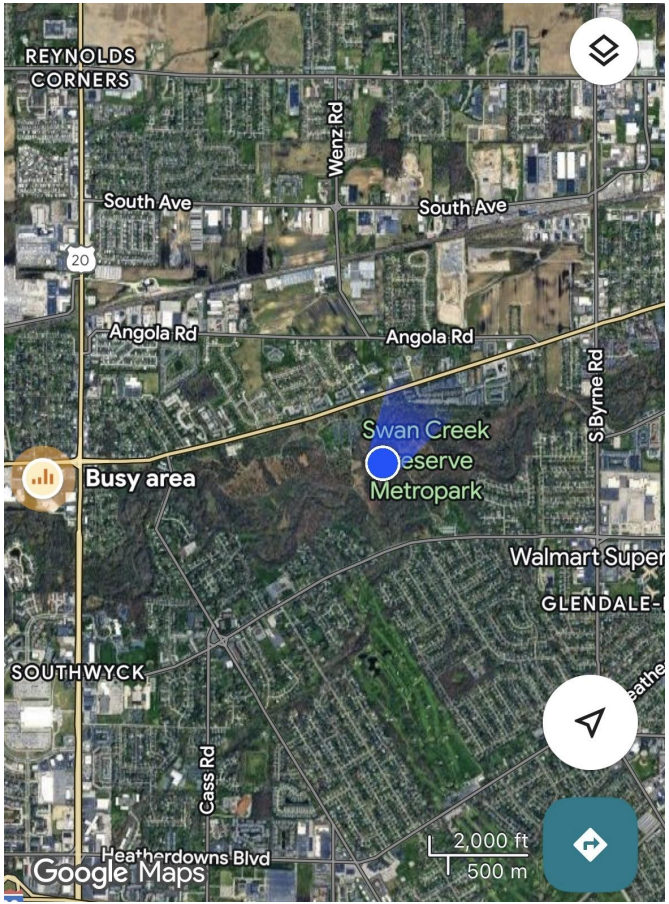


Wolf Creek

Photo credit: Reagan Anderson, Map credit: Google Maps

Results: Swan Creek

Swan Creek	Temperature	pH	Nitrite	Nitrate	Hardness	Phosphates	Dissolved Oxygen
Test 1	48°F	7.97	0	0	250	0.3	8
Test 2	44°F	6	0	0	300	0.2	6
Test 3	35°F	7.89	0	0	250	0.1	13

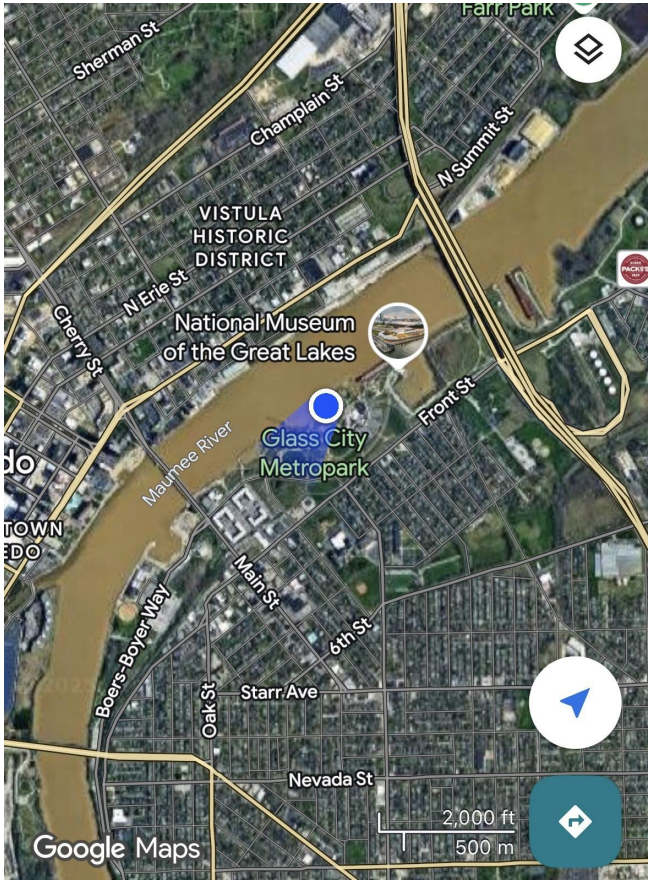


Swan Creek

Photo credit: Reagan Anderson, Map credit: Google Maps

Results: Maumee River

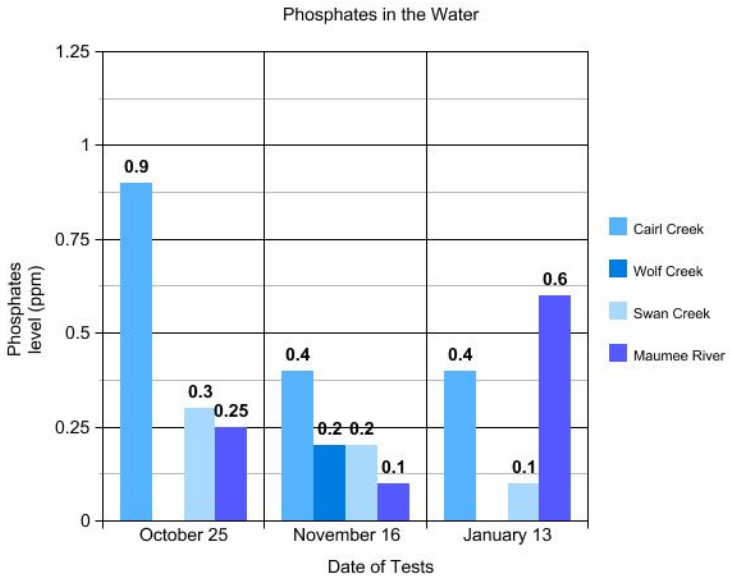
Maumee River	Temperature	pH	Nitrite	Nitrate	Hardness	Phosphates	Dissolved Oxygen
Test 1	59°F	8.27	0	0	250	0.25	6
Test 2	46°F	6	0	0	300	0.1	3
Test 3	37°F	8.02	0	0	250	0.6	11

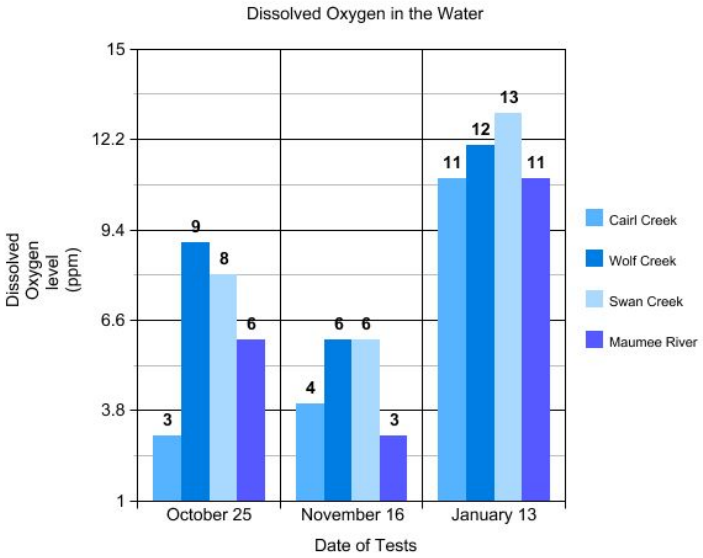


Maumee River

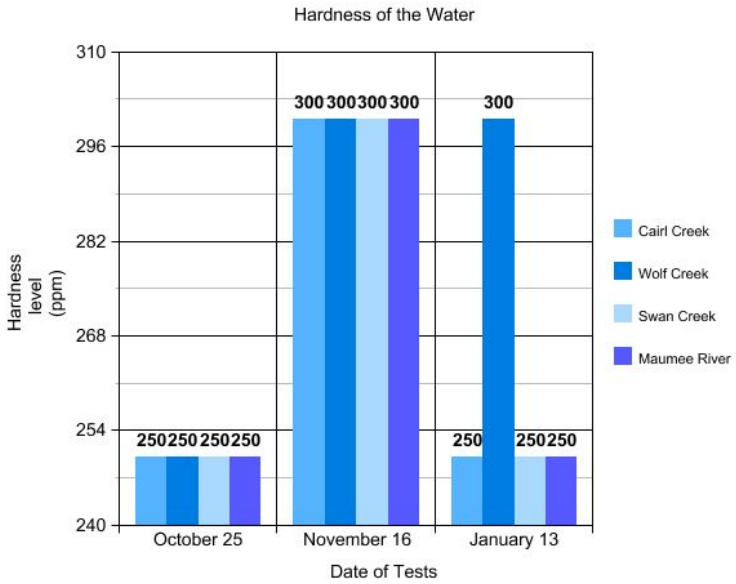
Photo credit: Reagan Anderson, Map credit: Google Maps

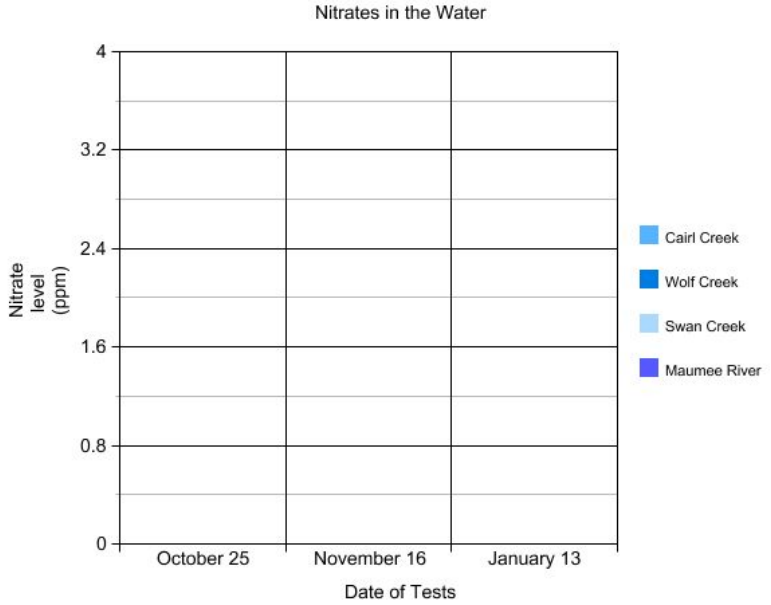
Graphs


Phosphates in the Water
Phosphates level (ppm)
1.25
1
0.75
0.5
0.25
0
0.9
0.3
0.25
0.4
0.2
0.2
0.1
0.4
0.1
0.6
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River

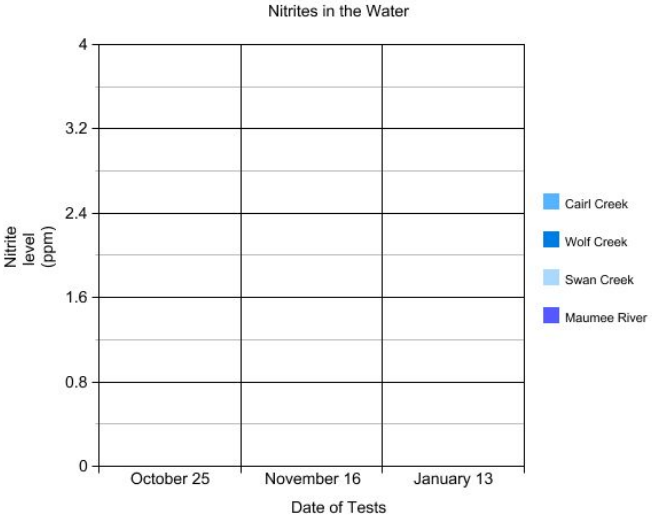

Dissolved Oxygen in the Water
Dissolved Oxygen level (ppm)
15
12.2
9.4
6.6
3.8
1
3
9
8
6
4
6
6
3
11
12
13
11
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River

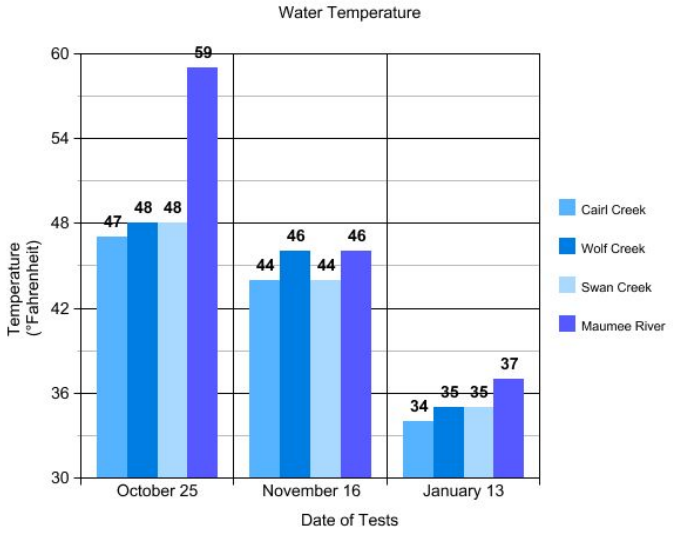
Graphs

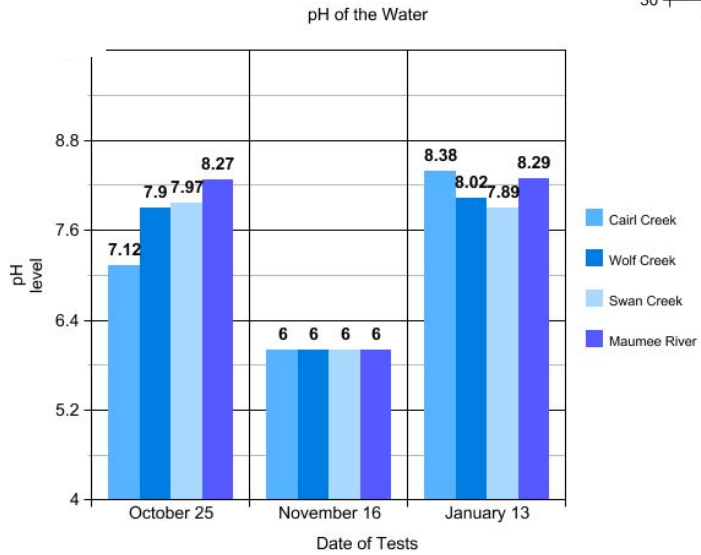

Hardness of the Water
310
296
282
268
254
240
Hardness level (ppm)
250 250 250 250
300 300 300 300
250 300 250 250
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River


Nitrates in the Water
4
3.2
2.4
1.6
0.8
0
Nitrate level (ppm)
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River

Graphs


Nitrites in the Water
Nitrite level (ppm)
4
3.2
2.4
1.6
0.8
0
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River


Water Temperature
Temperature (°Fahrenheit)
60
54
48
42
36
30
47
48
48
59
44
46
44
46
34
35
35
37
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River


pH of the Water
pH level
8.8
7.6
6.4
5.2
4
7.12
7.9
7.97
8.27
6
6
6
6
8.38
8.02
7.89
8.29
October 25
November 16
January 13
Date of Tests
Cairl Creek
Wolf Creek
Swan Creek
Maumee River

Statistical Analysis

	Temperature	pH	Nitrite	Nitrate	Hardness	Phosphates	Dissolved Oxygen
Mean	43.58	7.32	0	0	270.83	0.288	7.67
Mode	35, 44, 46, 48	6	0	0	250	0, 0.1, 0.2, 0.4	6
Median	45	7.895	0	0	250	0.225	7
Range	25	2.38	0	0	50	0.8	10
Standard Deviation	6.96967	0.96148	0	0	24.65033	0.25010	3.37474

Statistical Analysis Summary

The table shows the results of the analysis of all data collected.

- The mean is the average value of a number set
- The mode is the value that appears the most
- The median is the “middle value”
- The range is the difference from the highest value to the lowest value in a data set
- Standard deviation is a measure of consistency of results

Discussion

A few problems I encountered during my project was the second test the pH was taken with a strip test instead of the probe that I used for the other two. Another problem was for the last test there was no sample cup for the dissolved oxygen or phosphates. This may have affected the results for those two on January 13. I was surprised that the dissolved oxygen, on January 13, was so high. I was expecting it to be lower, similar to the other two tests. I learned so much from this project especially about the Maumee Watershed and taking water quality tests. I liked this project, as I was always interested by water, especially Cairl Creek, which runs through my backyard. It was challenging to find time to take test as they are time consuming when you have to do seven tests at four different locations. Overall, it was a great experience, but next time I would like to be more precise in taking these tests.

Conclusion

My hypothesis was not supported by my results. For example, the Maumee River phosphate level was not the highest, it was Cairl Creek that had the highest. The best water qualities were in Wolf Creek and Swan Creek. I believe this is so, as Swan Creek is a Metropark, which leads me to believe that they try to keep out pollutants that would negatively affect the water quality. I believe Cairl Creek has the worst water quality, as the water does not flow very quickly and there are many parts of the creek where it is clogged up from leaves and also trash. The leaves cause a higher phosphorus level, which we did see. This is why my hypothesis was not supported by my results.

Further Research

If I repeated this experiment I would add another location, which would be at Lake Erie. This would show on a larger scale how the water quality differs from location to location. I would also take the tests more frequently to see if it changes with the seasons. For the problems that I faced I would have to just pay more attention when I take the tests, especially when I have to take a different step than the other tests.

References

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Acknowledgements

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