Water Quality Project

Locations:

- Cedar Lake
- Camp Courage campus pond
- Mississippi River: North of the Monticello power plant
- Mississippi River: South of the Monticello power plant

Tests Performed:

Week 1

pH test

pH is the acidity of a liquid.

Hypothesis: I think that after the power plants water test will have about the same PH as before because they just use the water to cool off the reactors. I also thing the lake will have a higher PH than the pond because it has more pollution.

Test results:

Before the power plants had a pH of 8.
After the power plants had a pH of 7.
The lake had a pH of 9.
The pond had a pH of 7.

Conclusion- My hypothesis was correct the river samples were about the same and the lake had a higher p H that the pond.

Week 2

Hypothesis: I don't think that the pH will change all that much because not much is gonna change in a week.

Test results:

Before the power plants had a pH of 8.
After the power plants had a pH 8.
The lake had a pH of 8.
The pond also had a pH of 8.

Conclusion- My hypothesis was right not much has changed.

Week 3

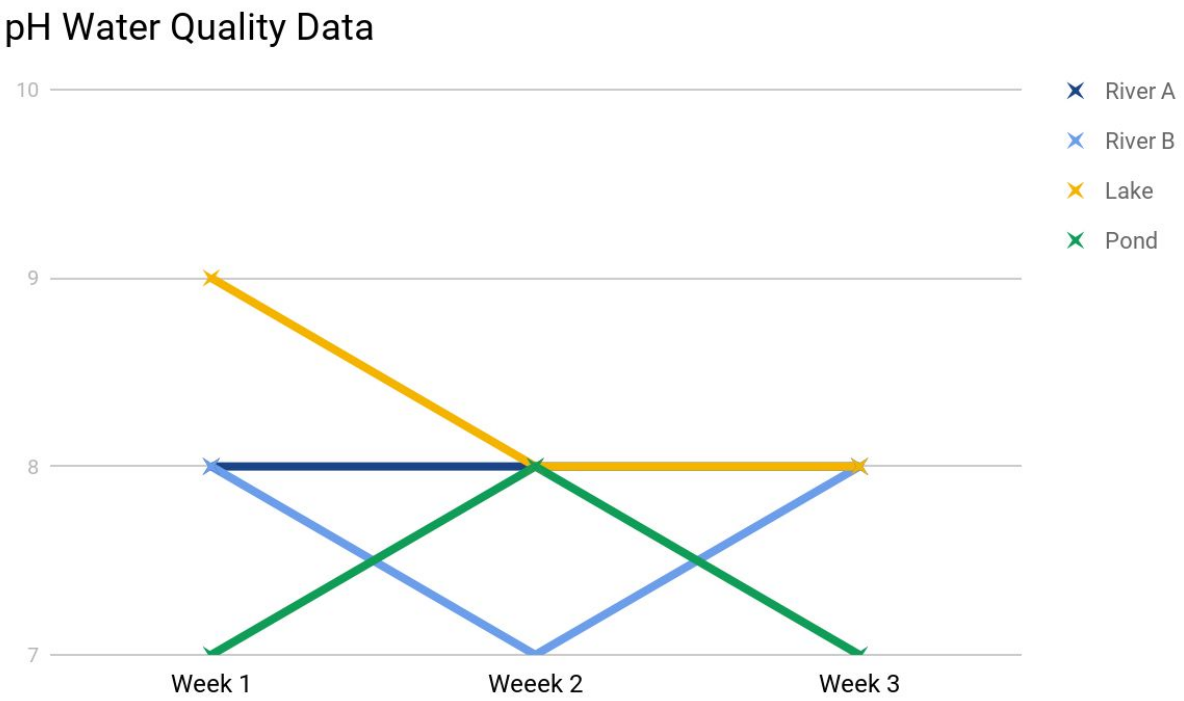
Hypothesis: If anything has changed I think it will be the river samples because the river started flooding and that may create a higher pH because their might be more chemicals draining into the river.

Test results:

Before the power plants had a pH of 8.

After the power plants had a pH of 7.
The lake had a pH of 8.
The pond had a pH of 7.

Conclusion- My hypothesis was not right and nothing had changed.



Temperature
Temperature is the intensity of heat present in a substance. You can calculate it in fahrenheit and celsius.

Hypothesis: I think that the water after the power plant will be quite a bit warmer because they use the river water to cool off the reactors so the water has to get warmer. The river also stays open after the power plant in the winter time and before the power plant the river freezes over. Also think that the pond will be warmer or colder depending on the temperature outside because the pond will warm up and cool off faster that the lake.
Formula for Celsius- C= (F - 32) * 5/9

Test results:

Week 1

Before the power plants had a temperature of 68.4 degrees Fahrenheit or 20 degrees Celsius.
After the power plants had a temperature of 72.2 degrees Fahrenheit or 22 degrees Celsius.
The lake and the pond had a temperature of 66.8 degrees Fahrenheit or 19 degrees Celsius.

Week 2

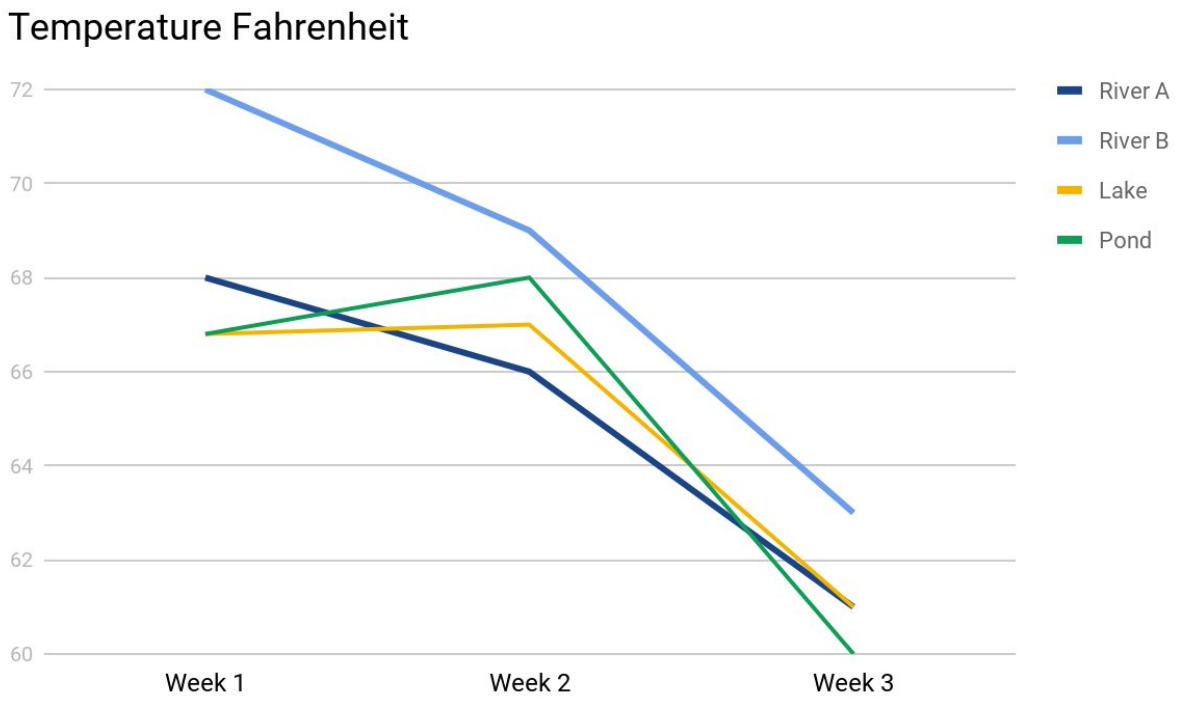
Before the power plants had a temperature of 66 degrees Fahrenheit or almost 19 degrees Celsius.

After the power plants had a temperature of 69 degrees Fahrenheit or 20.5 degrees Celsius.
The lake had a temperature of 67 degrees Fahrenheit or almost 19.5 degrees Celsius.
The pond had a temperature of 68 degrees Fahrenheit or 20 degrees Celsius.

Week 3

Before the power plants had a temperature of 61 degrees Fahrenheit or 16 degrees Celsius.
After the power plants had a temperature of 63 degrees Fahrenheit or 17 degrees Celsius
The lake had a temperature of 61 degrees Fahrenheit or 16 degrees Celsius.
The pond had a temperature of 60 degrees Fahrenheit or 15.5 degrees Celsius.

Conclusion- My hypothesis what sort of right, the water after the power plant was definitely warmer than before which was expected. But the pond water was almost exactly the same temperature as the lake.



Dissolved Oxygen test:

Dissolved oxygen is the amount of oxygen dissolved in water. In polluted or slow moving water much of the dissolved oxygen is consumed by bacteria and algae therefore robbing other aquatic organisms from the dissolved oxygen they need to survive.

Hypothesis: I think that the river will have more dissolved oxygen because of all the rippling water. The pond will have more dissolved oxygen than the lake cause of more vegetation.

Test results:

Week 1

Before the power plants had 4 ppm of dissolved oxygen. Ppm is the abbreviation for parts per million.
After the power plants also had 4 ppm of dissolved oxygen.
The lake had 3 ppm of dissolved oxygen.
The pond had 5 ppm dissolved oxygen.

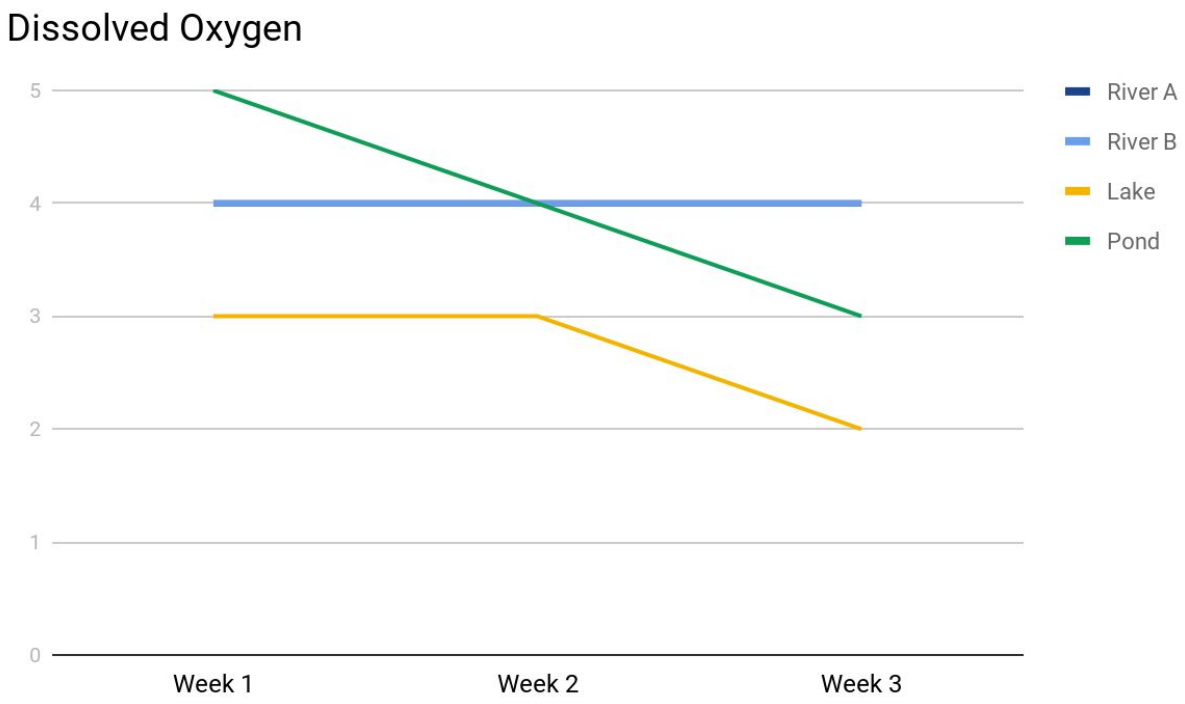
Week 2

Before the power plants and after them both had 4 ppm dissolved oxygen again.
The lake had 3 ppm dissolved oxygen.
The pond had 4 ppm dissolved oxygen.

Week 3

Before the power plants and after them both had 4 ppm dissolved oxygen again.
The lake had 2 ppm dissolved oxygen.
The pond had 3 ppm dissolved oxygen.

Conclusion- My Hypothesis was correct every time. The river had more dissolved oxygen most of the time, the pond was up there tho with the river.



Nitrates

Nitrogen is a nutrient that acts as a fertilizer for aquatic plants.

Hypothesis: I think that their might be little amounts of nitrogen in the lake and pond water samples because their is a lot of vegetation.

Test results:

Week 1, 2, and 3

Turns out their wasn't any nitrogen in any of the water samples throughout the three weeks. Well there could of been really small amounts because I saw a little bit of tint to the water but it was mostly clear. Same thing happened every week.

Turbidity

Turbidity is the clearness of a liquid. Drinking water is at 0 NTU's. NTU's stands for Nephelometric Turbidity Units. Nephelometric is a tool used studying the density of particles in the water.

Hypothesis: I think that the lake will have the least NTU's meaning the clearest and the pond will have the most NTU's because it looked really dirty.

Week 1

Before the power plants had 1 NTU's.
After the power plants had 4.5 NTU's.
The lake had 13 NTU's.
The pond had 17 NTU's.

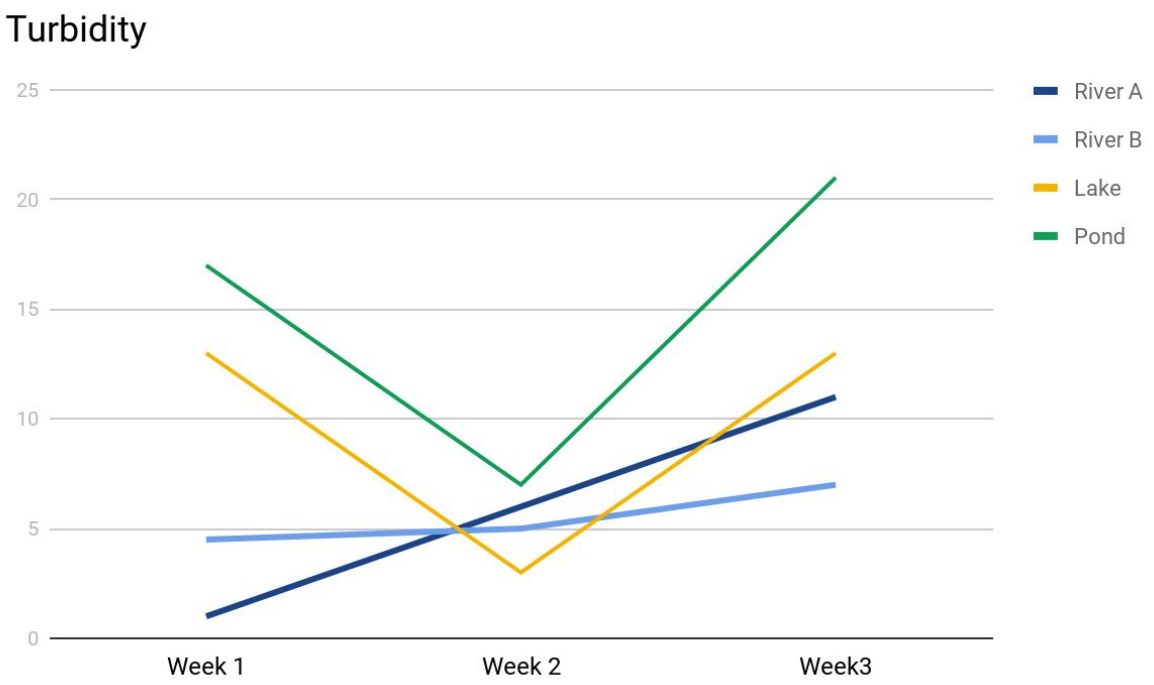
Week 2

Before the power plants had 6 NTU's.
After the power plants had 5 NTU's.
The lake had 3 NTU's.
The pond had 7 NTU's.

Week 3

Before the power plants had 11.3 NTU's.
After the power plants had 7.1 NTU's.
The lake had 13 NTU's.
The pond had 21 NTU's.

Conclusion- My hypothesis was sort of right, the pond had the highest amount of NTU's. The river was surprisingly clearer than the lake most of the time.



Coliform bacteria

Coliform bacteria: Is a bacteria present in the human digestive system. It isn't good to find coliform bacteria in water because it is an indication that there is sewage or fecal contamination in the water.

Hypothesis: I don't think that there will be any coliform bacteria in any of the water samples.

Conclusion- Luckily none of the water samples throughout the three weeks had any indication of coliform bacteria. Which is really good and means that the water is very quality.

Project Conclusion

Overall all the river, lake and pond water were essentially high quality water. There was no bad bacteria or fecal pollution in any of the water samples. The lake had the highest pH every time, but that could be from more pollution in the water since it is a public body of water. It was cool to see if how the water samples were different from each other. Some of the results were very surprising.

Assumptions Before Doing the Water Tests

Before starting the water tests I assumed that the water after the power plants were going to be much warmer, but I didn't know how much warmer it would be. I assumed that the water tests were going to be much more complex than they were, but they were actually very simple.

The Effect on Science

The impact of doing water quality tests is very good for the environment. By using water quality information, people will improve those bodies of water. It tells us what we need to do to help a body of water to thrive and be as healthy as can be. It can tell us what different chemicals or pollutants are getting into the body of water, therefore we can find a solution to fix that problem. Dissolved oxygen is the most important test according to NASA (the National Aeronautics and Space Administration), because it is the most important factor in supporting aquatic life. The temperature is the biggest thing that affects the dissolved oxygen in the water. The colder the water the more dissolved oxygen will be present. In colder water the molecules are more compact and doesn't have space for dissolved oxygen molecules to escape. When the water is warmer it allows for larger spaces between the molecules therefore letting more dissolved oxygen molecules out. That's why for example a trout needs really cold moving water to survive, because they need more oxygen than other fish. Also, if we didn't know what pH was we would know if the water is stable enough to support aquatic life. If the pH is below 4 or above 9 everything is dead. The reason for that is because if the pH is less than 4 it is to basic and if it is above 9 it is too acidic to support life. I found something really interesting out, I discovered that there was thermal pollution going on in the river because the water temperature was 5 degrees warmer than before the power plant. This is caused from the power plants in Monticello/Becker.

Chemical Reactions

Nitrates
The test tabs for nitrates contain sulfamic acid which destroys any nitrate that is in the sample, then turning the color of the water a pink color. The darker the color the more nitrates are in the water. There was no chemical change in this test because all the water tests had no indication that there was nitrates in the water.

Coliform test - The coliform bacteria contains nutrients to support the growth of coliform bacteria. If coliform bacteria is present in the sample, gas will be generated and the bacteria will metabolize the nutrients in the tablet. In all of the samples I had no coliform bacteria present so their was no chemical change, all the nutrients in the tablet stayed the same.

Dissolved oxygen - Dissolved oxygen test tablets contain sodium citrate and 2,4-Diaminophenol dihydrochloride. Oxygen, in a solution buffered by sodium citrate, oxidizes a proportionate amount of 2,4-Diaminophenol dihydrochloride to produce a colored solution. 2,-4- Diaminophenol dihydrochloride is a color accelerator that a lot of companies use in the dyeing industry.

pH - Is the most common test in water testing. It is the measurement of hydrogen ions in a water sample. If the pH is below 7 it is considered acidic. The pH tablet contains a mixed pH indicators which are sensitive to pH and go through specific color changes with variation in pH.

Factors of Chemical Reactions

- Water temperature can affect a chemical reaction by a lot. When the water temperature is cold the molecules move slower and when it is hot they move faster which changes how reactive the reaction will be.
- Changing the pressure on a reaction that only involves solids or liquids has no effect on the rate of chemical change.
- Particle size in the water effects turbidity because if there's any sort of little particle in the water it will come out having more NTUs.
- The rate of chemical reaction can also be raised by increasing the surface area of a solid reactant.
- Catalyst is a substance that causes or accelerates a chemical reaction without itself being affected.