# How does Rainfall Affect Dissolved Oxygen Levels?

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## Abstract

In this project, we performed a series of tests to find answers to our research question, how does rainfall affect dissolved oxygen levels. We began by creating a hypothesis which is, if precipitation levels increase then dissolved oxygen levels will also increase because rainwater absorbs oxygen from the atmosphere as it falls, therefore adding more oxygen to the water when it mixes in. Then, we recorded the amount of rainfall before collecting water samples and measuring its dissolved oxygen. Finally, we added our data into multiple different types of graphs, bar graphs and lines graphs, and then analyzed the data and results. We came to the conclusion that our hypothesis was indeed correct as our data showed a positive correlation, as the precipitation levels increased, so did the dissolved oxygen levels.

## Research Question

How does rainfall affect dissolved oxygen levels? This is an important question that needs an answer because dissolved oxygen levels affect aquatic life and we need to find solutions to make sure there's variety and life within our underwater ecosystem. This keeps everything in balance leading to a better circle of life and without aquatic animals and plants, dissolved oxygen levels could decrease and make water quality unsafe for humans to use.

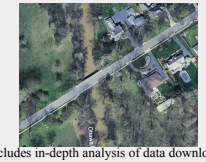
## Introduction

- How does rainfall affect dissolved oxygen? With looking at the data from dissolved oxygen it striked curiosity about the different factors that affected it. With the increase of rainfall the dissolved oxygen levels tend to rise because as the rain falls it gets saturated with oxygen. While with the cloudier and colder days that rain tends to bring the dissolved oxygen lower as well.
-This is an important topic to talk about because like how humans need oxygen to breathe aquatic animals and plants need dissolved oxygen to breathe.
-The Fondriest Environmental Learning Center states, "Fish and crustaceans obtain oxygen for respiration through their gills, while plant life and phytoplankton require dissolved oxygen for respiration when there is no light for photosynthesis." So, depending on the DO levels, it is a direct indicator of how the aquatic resources are and the water's ability to support aquatic life.
-According to USGS's (2018) article Dissolved Oxygen and Water "Bacteria water can consume oxygen as organic matter decays. Thus, excess organic material in lakes and rivers can cause eutrophic conditions, which is an oxygen-deficient situation that can cause a water body to 'die.'" Aquatic life can have a hard time in stagnant water that has a lot of rotting, organic material in it, rainfall often will make the stagnant water move around, making the oxygen content higher. -Factors such as humans and invasive species can cause more intense and frequent rainfalls and can cause issues like sediment runoff which can negatively impact dissolved oxygen levels. -Pollution can also decrease dissolved oxygen levels. It creates a food source for bacteria which can rapidly consume oxygen during the composition process. By limiting the amount of fossil fuels used, ending deforestation, and stopping pollution, humans can help increase dissolved oxygen levels, creating more safe water sources. -The Fondriest Environmental Learning Center (2025) mentions, "While most photosynthesis takes place at the surface (by shallow water plants and algae), a large portion of the process takes place underwater (by seaweed, sub-surface algae, and phytoplankton). Underwater plants and algae can help increase dissolved oxygen levels in the water. The underwater plants would take in carbon dioxide and light that will in turn produce more oxygen but underwater, thus increasing the dissolved oxygen levels. -Overall, dissolved oxygen is extremely important for both aquatic life and human life. By limiting the amount of harmful activity, humans can help create safe habitats for aquatic animals and plants and in return, receive more safe water sources.

## Research Methods

The area of study was the Ottawa River which contains vegetation on the banks and a rocky bottom. The water at the time of our experiment was relatively clear and the temperature outside ranged from 70 to 30 degrees and the water never froze.The area around it is a hilly field that floods often. The samples were collected around 11:30 am because we wanted to keep the time a constant variable.

The next test is the dissolved oxygen test so first grab a dissolved oxygen kit. Then, to measure the dissolved oxygen, take a clean and dry beaker and fill it 25 mL full of water from that same bucket. Next, take a clear reactant filled probe and place the probe in the beaker until the bottom of the probe is touching the bottom of the beaker. Then, lightly push the probe tip into the side of the beaker making sure the tip breaks off. Be careful because the probe is made out of glass. Once the tip breaks, let the fluid in the probe change color for 5 seconds. After that, take the probe out of the water. Carefully put your finger on the open hole in the probe making sure not to cut yourself with the glass and gently tip the probe up and down for about 5-10 seconds to get a consistent color. After, use the provided testers to compare the saturation of the blue color. Next, record your data in the same document you recorded your temperature in. Then, take the beaker and slowly pour out the water making sure not to pour the probe tip down the drain. Next, dispose of the glass probe and tip into a glass trash can. Finally, rinse out the beaker, dry it, and put the kit and the thermometer away. Make sure to repeat these same steps and do 4 trials each one week apart using the same water source and materials.



This report includes in-depth analysis of data downloaded from the GLOBE database as well as students' own data sources, if new data was collected. Students discuss limitations of these data; make inferences about past, present, or future events, or use data to answer questions or solve problems in the represented system.

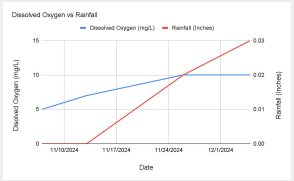
## Results

Looking at the results, we saw a trend that when there was rainfall, the dissolved oxygen levels increased. This could be, because as the rain falls it absorbs oxygen, leading to the bodies of water having higher dissolved oxygen. Data shows on November 7th and 13th, when there was no rainfall the dissolved oxygen levels were 5 mg/L and 7 mg/L, compared to November 26th when there was 0.02 inches of rainfall, and December 5th with 0.03 inches of rain the levels increased to 10 mg/L. Looking at the graph there is a general increase which could show how the dissolved oxygen and rainfall levels increase simultaneously. While on November 7th and 13th, the rainfall levels were the same they had slightly different dissolved oxygen levels. That led us to think about the other variables that could affect the levels, which could be a difference in time that the data was taken, the difference in an area where the data was taken which could differ if the area where our data was taken didn't experience rainfall while the area that collected the rainfall data did.

| Test Date | Dissolved Oxygen in mg/L |
|---|---|
| 11/7/24 | 5 mg/L |
| 11/13/24 | 7 mg/L |
| 11/26/24 | 10 mg/L |
| 12/5/24 | 10 mg/L |

**Rainfall Data Table:**

| Test Date | Rainfall |
|---|---|
| 11/7/24 | 0 in |
| 11/13/24 | 0 in |
| 11/26/24 | 0.02 in |
| 12/5/24 | 0.03 in |




## Discussion

If we were to repeat this project, here are some possible improvements that could be made. One thing we could do differently would be to perform this experiment over a longer period of time. This would allow us to look at all seasons and factors that could affect rainfall which in result affects dissolved oxygen. This could improve the data by having more tests that could show outliers or more extreme data points. It could also improve accuracy of our test points as there would be more data available. These improvements to this experiment could allow other scientists to use our data and better understand our environment. New solutions could help improve underwater ecosystems such as animal population and plant life. Some extensions for further study include temperature, water visibility, and ph. Scientists at Cambridge University also studied dissolved oxygen with the factor being rainfall. They found that rainfall is a main factor of controlling bacterial activity. This gives more importance to the quality of rainfall. By planting trees and other vegetation, we can increase and assure a healthy rainfall.

## Conclusions

Overall, our experiment found that there is a correlation between dissolved oxygen and rainfall. After testing our water sources dissolved oxygen levels and rainfall in the area, over a period of time, we were able to conclude that as rainfall increases so does dissolved oxygen levels. Theoretical values led us to conclude that our first two days are an average level of DO in natural waters (7-9 mg/L). While the last two had levels of 10 mg/L which is above average and often appears in clear and cold streams. All of the data points were to be expected, due to them matching with the rainfall. It was expected that if there was more rainfall, the dissolved oxygen levels would increase because as the rain falls, oxygen saturates it.

## Bibliography

We would like to acknowledge Dr. KG as she provided us with the materials and water sample, in which we tested. We would also like to acknowledge Sara Mierzwiak who helped us get outside sources about the rainfall levels and also strengthen our supporting question.