Infrastructure and the pH/DO Levels of Boulder Creek

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Introduction

- Over the past decade, various pollutants have been acidifying freshwater ecosystems in many continents of the world (Spyra 2017). Recent experiments have revealed that the geochemistry of rainwater/ runoff that passes through various forms of infrastructure, such as concrete pipes, can be heavily modified in many ways, such as pH and oxygen levels (Wright, et al). Thus, water bodies that consistently obtain this runoff could potentially see the impact of this chemically affected runoff. Unnatural acidification can drastically change the structure and function of entire ecosystems, alongside decreased levels of dissolved oxygen.
- It has been suggested that other factors such as huge amounts of sewage runoff, intense heat and a humid climate play bigger roles in shifting the pH and oxygen levels of water bodies (Potter, et al). This deems the question, does human activity/ infrastructure presence alone have a significant effect on pH and dissolved oxygen levels of surrounding water bodies due to the affected chemistry of the water that feeds into them?

Question: Does human activity/ infrastructure presence have a significant effect on pH and dissolved oxygen levels of Boulder creek?

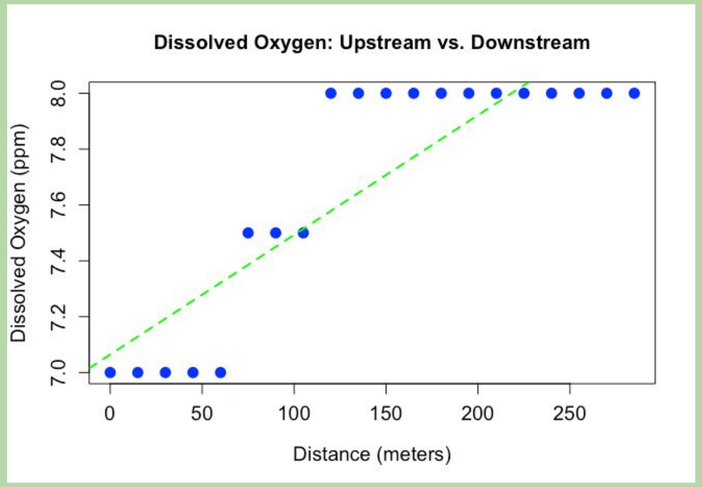
Hypothesis: The pH of the creek in areas with more infrastructure and human activity will be more acidic and the dissolved oxygen will be lower than in places more isolated.

Methods

- Levels of pH and dissolved oxygen were measured from various points along Boulder Creek using pH and dissolved oxygen strips.
- Compared these levels from starting upstream and moving further downstream in relation to human activity.
- Statistical analysis: A linear regression was used to analyze the data.

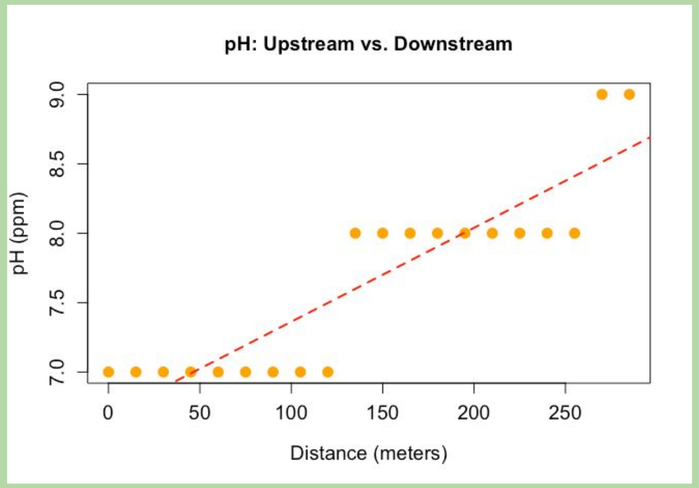
Results

Dissolved Oxygen Levels



- p-value: 6.554e-07, R-squared value: 0.7555

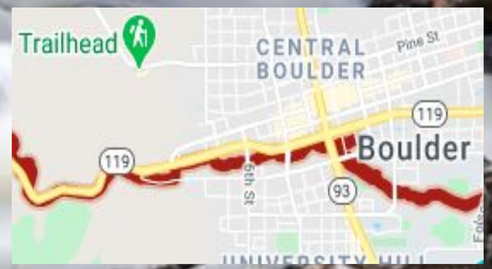
pH Levels



- p-value: 9.863e-08, R-squared value: 0.8013

Conclusions

- We were able to find support for our prediction that pH levels of Boulder Creek are overall more acidic in areas with greater amounts of infrastrucure than in areas with little to no amount. Dissolved oxygen levels also increased. Within the tests that we took, there was a noticeable increase in both pH levels and dissolved oxygen levels as we moved further down the creek. As we moved downstream, the amount of infrastrucure and human acivity lessened. This shows a strong relationship between the state of the creek and the surrounding human activity, or lack thereof.
- Our findings disclosed that the chemical changes of water sources caused by infrastructure alone can have significant impacts on surrounding water bodies. This means that as human activity increases, so do these negative effects on ecosystems. This conclusion is vital to understanding current human effects on water and ecosystems in Boulder county, current human effects everywhere, and how to reduce the negative environmental impact of mankind in the future.



References

Potter, J. D., McDowell, W. H., Helton, A. M., Daley, M. L. (2013). Incorporating urban infrastructure into biochemical assesment of urban tropical streams in Puerto Rico. *Springer Link*, 121(2014), 271-286.

Spyra, A. (2017). Acidic, Neutral and Alkaline Forest Ponds as a Landscape Element Affecting the Biodiversity of Freshwater Snails. *US National Library of Medicine National Institutes of Health, 104(9), 73.*

Wright, I. A., Davies, P. J., Findlay, S. J., Jonasson, O. J. (2011). A new type of water pollution concrete drainage infrastructure and geochemical contamination of urban water. *Marine and Freshwater Research, 62(12), 1355-1361.*