The Basic Truth: How pH Levels Affect Amphibian Abundance

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Abstract

A lot of life can be found around bodies of water, and the properties of this water can have a large effect on the life around it. The hypothesis is that water that is either basic or acidic will have an adverse effect on amphibian life. We looked at the various bodies of water in New York and found their mean pH level and amphibian abundance in a 5 mile radius. Our result showed that there is an exponential relationship between pH and amphibian abundance, which means that water that is acidic has a negative effect on the amphibian life around it.

Introduction

Pollution is a major environmental issue in the contemporary world. As residents of New York City we are part of a major area of pollution production. These pollutants are carried north towards the Adirondacks, at which acid rain contaminates many bodies of water. This unnatural acidity can have detrimental effects on both humans and animals. Some lakes and rivers have buffering capabilities, but for others this is not enough. Extreme pH levels can cause dramatic changes in the body of water's surrounding ecosystem. Prior to our research we predicted that the two extremes, acidic and alkaline, would cause a decrease in the abundance of amphibians compared to that of neutral bodies of water.

Method

- We used iNaturalist to find spatial data for amphibians in New York State. There were 332 sightings. iNaturalist utilizes public input of data, users record animal and plant species they see, which includes the location of the sighting.
- The mean pH level was recorded for various bodies of water in the state of New York. *We considered anything - or + .5 to the neutral pH value of 7 to be slightly acidic or alkaline for the study.
- The location of the selected bodies of water and sightings of amphibians were compiled onto one map.
- We recorded the abundance of amphibians near a body of water based on a 5 mile radius from that source.
- This information was compared to the pH level of the specific body of water.

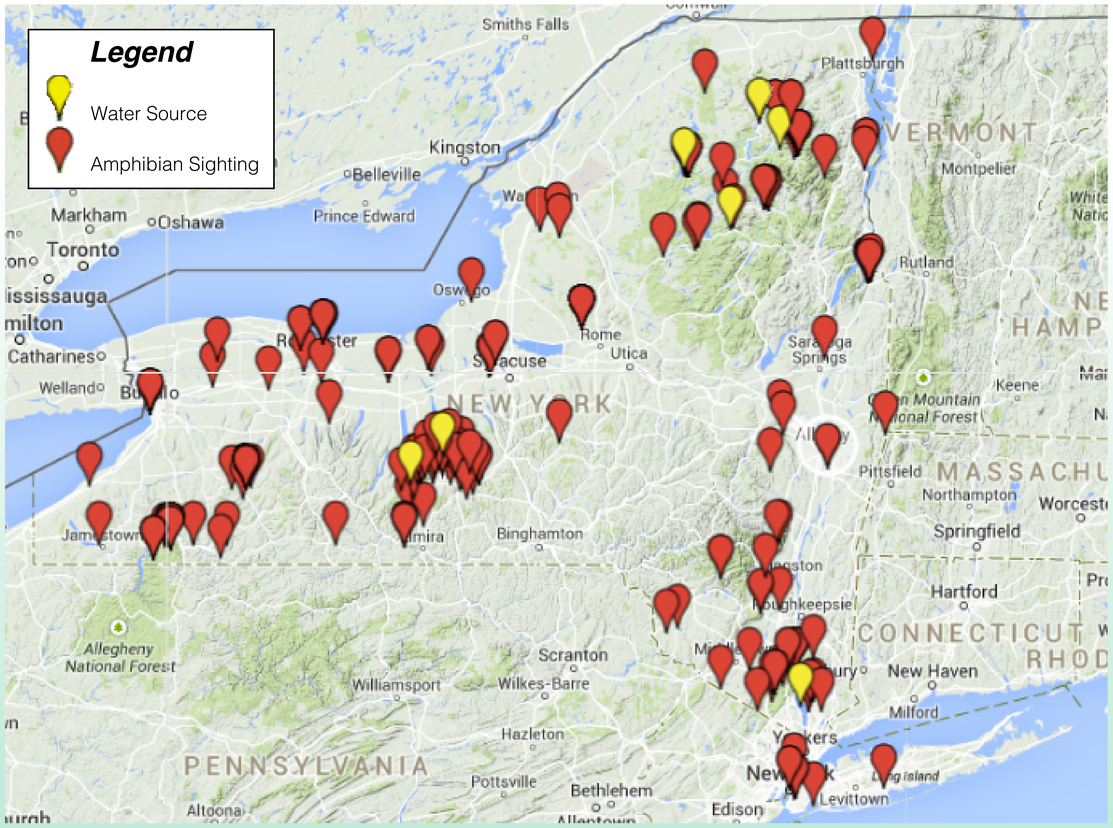
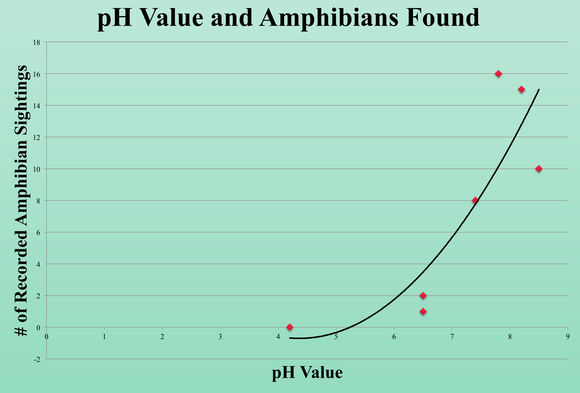


Table 1

Body of Water	pH Level	# of Amphibians
Little Echo Pond	4.2	0
Blue Mountain Lake	6.5	1
Osgood	6.5	2
Seneca Lake	7.4	8
Cranberry Lake	7.8	16
Cayuga Lake	8.2	15
Hudson River	8.5	10



Results

The graph to the left shows that there is a correlation between the pH of a body of water and the number of amphibians sighted around the body of water. We expected a normal distribution, or in other words the number of frogs would decrease the more acidic or more basic it is. Our graph and data show another trend, however. The data shows that the trend is exponential. Water with a basic pH level does not seem to have a detrimental effect on amphibian life. Water on the acidic side, however, seems to be harmful. Our data fails to show exactly what happens when the water is extremely basic. This is due to the lack of strong alkaline water in New York State. Further research would include the effects of alkaline water on amphibian life.

Conclusion

Our results indicate that amphibians are affected by the pH of the water around them. Water that is acidic is harmful to amphibians while slightly basic water doesn't seem to have such an adverse effect on them. Our results do not demonstrate what happens in water that is extremely alkaline. Understanding how alkaline water affects amphibians would be the next step in this experiment. Following which, we could analyze the weather patters in New York State. Based on how the pollution is travelled we can identify specific areas in the Adirondacks that could be affected dramatically by acid rain. This can lead to the development of stabilizing ecosystems in New York State and further used for other areas around major cities across the world.

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Acknowledgements

We would like to thank Brian Ford, Macaulay Honors College, and City University of New York for making this project possible.