

The Effect of Water Quality on Daphnia

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Introduction

- Access to clean water has a direct effect on human health with 2 million Americans not having access to clean water (U.S. Water Alliance, 2019)
- Water quality in Farmville differs between various water sources
- Gross Creek has been tested for E. Coli bacteria and Wilck's Lake is exposed to recreational pollution
- Daphnia are used as biomarkers for water quality due to their sensitivity to contaminants (Brookshire, 2016)
- Sensitivity is shown through heart rate and locomotion
- Normal daphnia heart rate is anywhere around 200 bpm; anything above or below shows signs of environmental stress

Specific Aim & Hypotheses

Specific Aim:

- Determine the water quality of local Farmville water sources (Gross Creek and Wilck's Lake) and their effects on daphnia

Hypotheses:

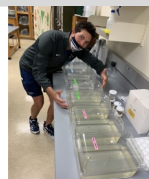
- Average heart rate of daphnia will increase in response to more polluted water (Perez, K. et al. 2019)
- Locomotion of daphnia will increase in more polluted water (O'Keefe, T. et al. 1998)

Methods

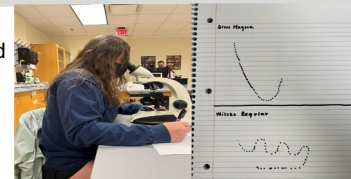
Two sterilized buckets were used to collect water from Gross Creek and Wilck's Lake



Three conditions including control spring water, Gross water, and Wilck's were analyzed with *daphnia magna*



Daphnia were placed on depression slide to measure heart rate using microscope



Collected locomotion data by having three group members stand in front of each tank and time how long it took for all daphnia to move from one side of the tank to the other

Results

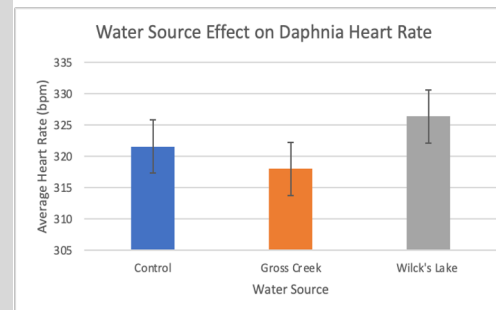


Figure 1. Comparison of average daphnia heart rate response to different water sources in Farmville, Virginia; Gross Creek and Wilck's Lake. ANOVA statistical test revealed a p-value of 0.943. Error bars represent the standard deviation.

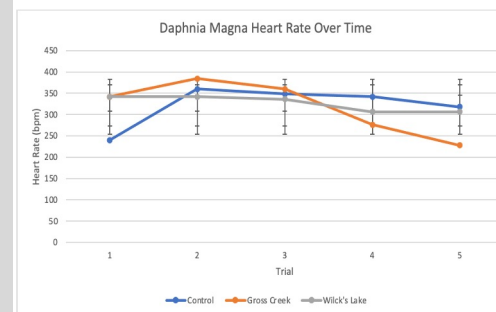


Figure 2. Change of daphnia heart rate over time in response to different water sources in Farmville, Virginia; Gross Creek and Wilck's Lake. Error bars represent the standard deviation.

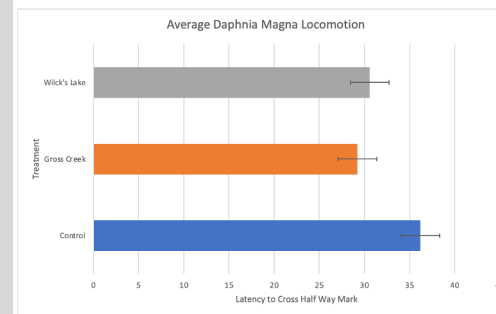


Figure 3. Comparison of daphnia magna locomotion from control and two treatment waters from Gross Creek and Wilck's Lake in Farmville, Virginia.. ANOVA statistical test revealed a p-value of 0.779. Error bars represent the standard deviation.

Discussion

- There was no statistical change in heart rate or locomotion among the three groups
- Gross Creek daphnia showed a decreased heart rate in comparison with Wilck's Lake daphnia
- Wilck's Lake daphnia showed an increase in heart rate in comparison with Gross Creek
- Daphnia were negatively impacted physiologically and behaviorally
- Our findings raise concerns about the physiological consequences of Gross and Wilck's Lake water on aquatic vertebrates, such as fish

Future Directions

- Complete a chemical analysis of the three water sources
- Investigate all four seasons and analyze the impact of seasonal changes on water quality
- Continued studies that will help identify factors that negatively affect quality of water sources

Acknowledgements

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