

Assessing the Quality of D.C.'s Waterways: Rock Creek and The Potomac River

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Introduction

- The quality of water in DC can determine the biological, chemical and physical characteristics between people and the water.
- Main Problems:
 - Rock Creek Park
 - Nitrate
 - E-Coli
 - Potomac River
 - Contamination (atrazine, trans-Nonachlor)
 - Recent Developments
 - Wastewater

Hypothesis

- Null Hypothesis: *The water quality in terms of salinity, conductivity, dissolved oxygen, pH, orthophosphate, and nitrate levels is the same in the Rock Creek and Potomac River.*
- The Rock Creek Park River water quality: in terms of low salinity, nitrate, conductivity, dissolved oxygen, orthophosphate and higher pH will be closer to the ideal freshwater ecosystem for sustaining life than the Potomac River.

Materials

- Sample collection:
 - Rock Creek Park – 3 Samples
 - Potomac River – 3 Samples
- Laboratory analysis: UDC Environmental Quality Testing Lab
 - Nitrate Testing Kit
 - Dionized Water
 - Molybidovandate Solution
 - Pipette
 - Control Variable: 25 (mL) dionized water
 - DR2800 Spectrophotometer
 - Dissolved oxygen probe, pH meter and conductivity meter

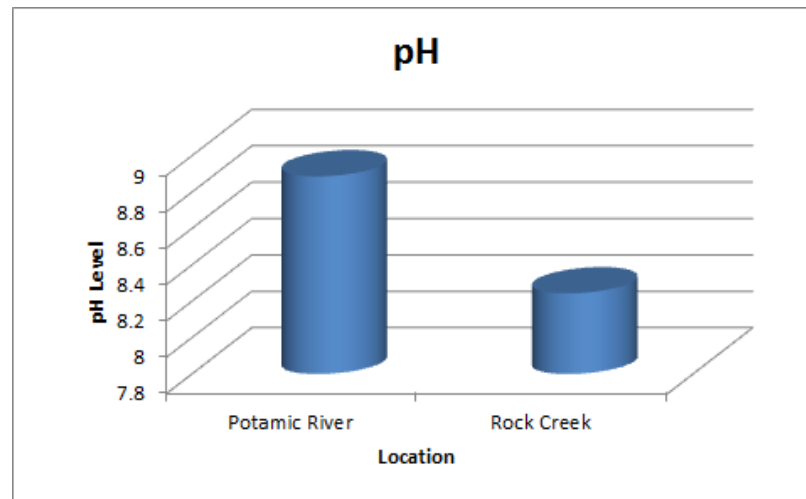
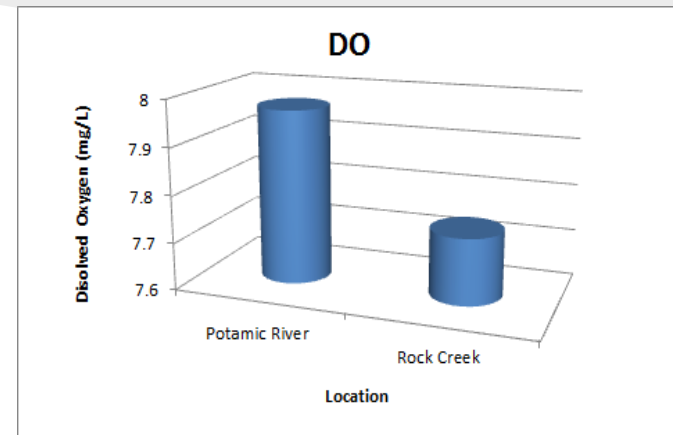
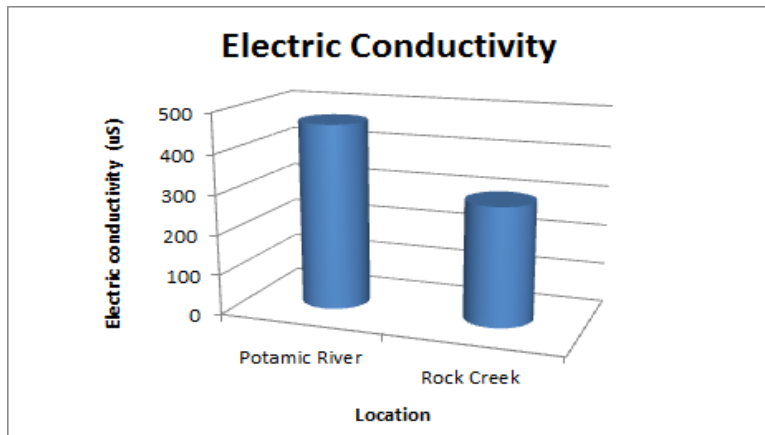


DR2800

Method

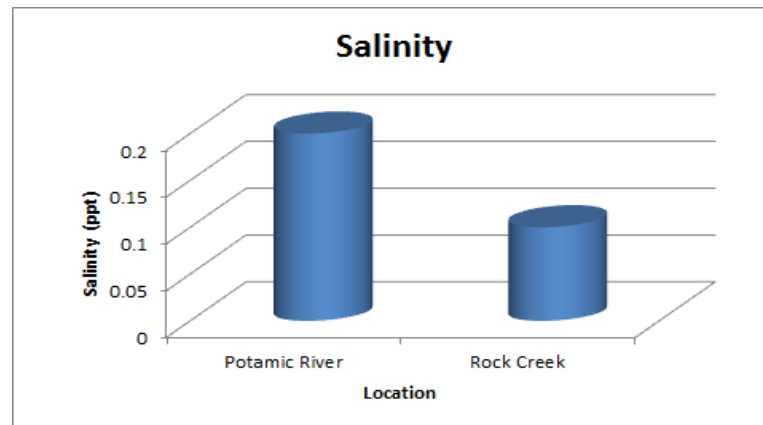
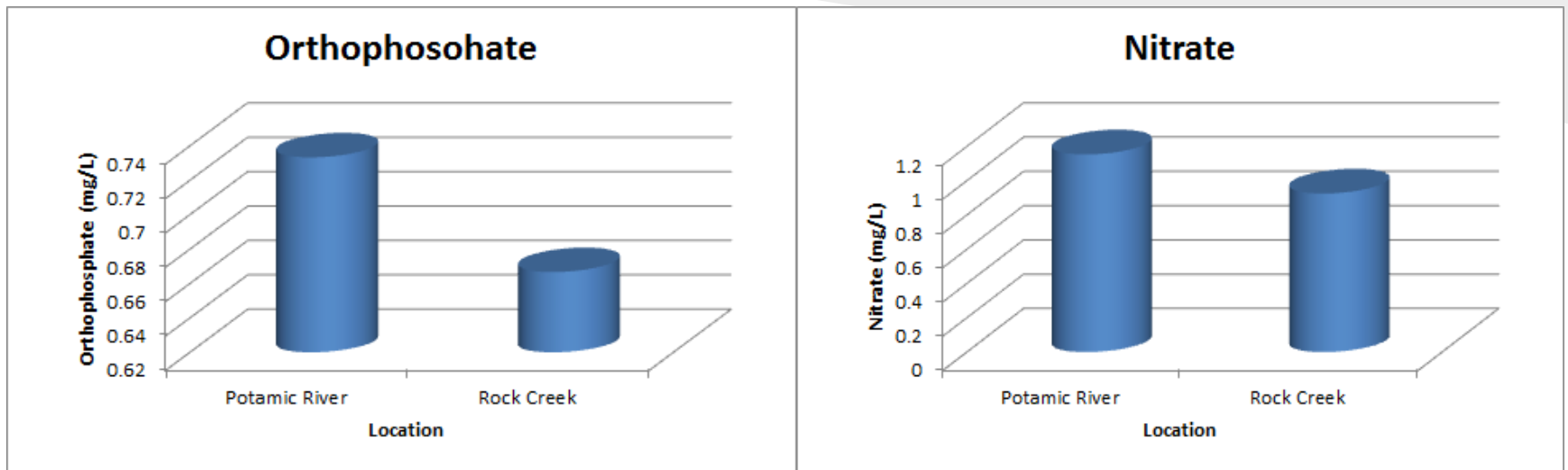


Results



Potomac River is higher in Conductivity, Dissolved Oxygen, and pH.

Results



Potomac River is higher in Orthophosphate, Nitrate, and Salinity.

Discussion

- Dissolved Oxygen
 - Dependent on water temperature
 - Normal Level: >5 mg/L
 - $p=0.3593$
- Electric Conductivity
 - Normal Range: 50-1500 uS/cm
 - $p=0.0002$
- pH
 - Normal Range: 6.5-8.5
 - $p=0.00299$
- Salinity
 - Normal Range: <0.5 ppt
 - $p=0.8551$
- Orthophosphate
 - Used to prevent pipe corrosion
 - In rivers, may indicate chemical runoff
 - Normal Range: <.1 mg/L
 - There is no significant difference in orthophosphate ($p=0.5286$)
- Nitrate
 - Used in fertilizers
 - Essential for plant growth
 - excess can kill water ecosystems
 - Normal Range: 0.01-3.0 mg/L
 - Natural Level: <1 mg/L
 - There is a significant difference in nitrate ($p=0.0273$)

Conclusion

- Rock Creek River had lower average orthophosphate, dissolved oxygen, pH, salinity, electrical conductivity, and nitrate levels.
- Statistical Significance:
 - Failure to reject null hypothesis in favor of the alternate
 - Not enough evidence to prove that the quality of the two rivers is statistically significantly different from one another in terms of orthophosphate, salinity and dissolved oxygen levels
- Data does not necessarily suggest that the rivers are safe to drink from without filtration due to other contaminants:
 - Bacteria
 - Chemicals not discussed

Resources

- "Conductivity." *U.S. E.P.A.* United States Environmental Protection Agency, 6 Mar. 2012. Web. 24 July 2013.
- "Interpreting Phosphorus Test Results." *RiverWatch*. The RiverWatch Institute of Alberta, 2010. Web. 24 July 2013.
- "Lehigh River Watershed Explorations." *EnvirSci Inquiry*. Lehigh University, 2011. Web. 24 July 2013.
- "Nitrates." *US EPA*. United States Environmental Protection Agency, 6 Mar. 2012. Web. 24 July 2013.
- "Water Quality in the Anacostia River, Maryland and Rock Creek, Washington, D.C.: Continuous and Discrete Monitoring with Simulations to Estimate Concentrations and Yields of Nutrients, Suspended Sediment, and Bacteria." *USGS Publications Warehouse*. U.S. Department of the Interior, 2013. Web. 24 July 2013.

Acknowledgement

- Funded by the national Science Foundation
- Implemented in collaboration with UDC 4-H and center for youth development





Kelly, Diamond, Jasmine and Dr. Deksissa