A Small Stream with Big Problems: A chemical investigation into the contaminated headwaters of the South River.

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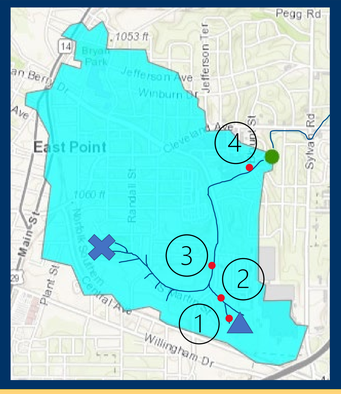
Introduction

The milky blue waters of the South River in East Point, Georgia have been a neighborhood concern for over thirty years. The odd color of the water can even be seen from satellite pictures. The headwater's watershed contains two sites with ominous histories: one site is listed as a Class 1 hazardous site "Δ" and one is listed as a Class 3 hazardous site "X", by the Georgia EPD. This watershed is littered with over one hundred years of chemical, battery, glass, fertilizer, and alum manufacturing waste, as well as a burned down cotton mill and a landfill. The river is surrounded by urban area, and much of it has been placed underground and is not reachable from surface level. Two tributaries that feed into the headwaters have been identified, and water and soil samples were obtained and analyzed to find contaminates.

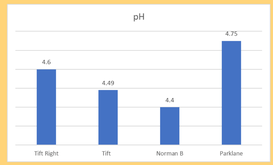
Hypothesis: **Chemical pollutants of the headwaters affect the appearance of the South River**

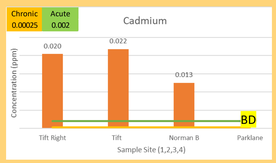


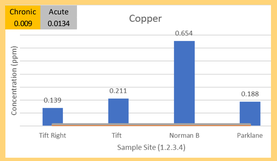
Equipment and Methods

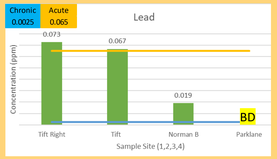
- LaMotte Wide range pH indicator
- Eutech EcoTestr EC conductivity meter μS/cm
- University of Georgia Center for Isotope Studies- Inductively Coupled Plasma-Optical Emission Spectrometer (Perkins Elmer Optima 8300), Direct Mercury Analyzer (DMA-80), Ion Chromatography (Dionex DX 500)
- LaMotte Surface Water Testing Kit
- Using the Georgia Adopt-A-Stream chemical form: Air temperature, water temperature, pH, dissolved oxygen and conductivity data were analyzed and noted on site
- Samples of soil and surface waters were collected into plastic containers
- Soils were dried, sorted, ground by hand then digested with acid
- Water samples were filtered and centrifuged to remove particulates as needed

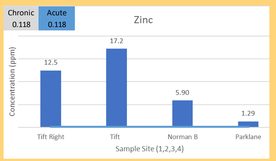
Data/ Results

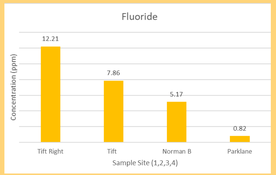












The highest point reachable, above ground of the watershed, was the right branch at the Tift site "1". The sample sites continue downstream. The Tift site "2" is where the left and right reach meet. The Norman Berry sample site "3" is where the water from Tift meets the west branch. One mile downstream is the Parklane Elementary site "4". The first chart shows the pH of the four samples sent for testing. The average of all samples taken was a pH of 4.5. ICP-OES determined concentrations of cadmium, copper, lead, and zinc were compared to the Georgia EPD (391-3-6-.03) "Water Use Classifications and Water Quality Standards" document. Chronic and acute concentrations were calculated using a water hardness of 100. The cadmium concentration was significantly higher than the chronic (0.25 ppb) and acute (2.0 ppb) levels for Georgia recreational surface waters in three of the four sample sites. Parklane was below the detection limit of 0.004 ppm. The copper concentration at all four sites was greater than the chronic (9.0 ppb) and acute (13.4 ppb) levels. The lead concentration at both Tift sites was greater than the acute (65.0 ppb) level, Norman Berry was greater than the chronic (2.5 ppb) level and Parklane was below the detection limit of 0.013 ppm. The zinc concentration at all four sites was significantly greater than the chronic/ acute level (0.118 ppm). There are no standards for anions. However, the ion chromatography results for fluoride was noted as high.

Conclusion

Water traveling down this watershed into the South River's headwaters is picking up pollutants that give the water a milky blue appearance. The low pH allows for more dissolved metals in the water. As the water travels down the feeder streams from the Tift site to Parklane elementary, the levels of heavy metals and anions decrease and the pH increases. This appears to be due to dilution from other feeder streams and no new sources of pollutants. There is a spike of copper at the Norman Berry site. The source appears to come from the west feeder stream, but there were no contact points to test further in that direction to confirm. Several states have identified standard levels for sulfates and other ions. More research will have to be done to identify what is the standard to hold these headwaters in comparison to. The next step in research will be to try and recreate the appearance of a stationary water sample by adding these elements and ions. This will hopefully answer the question of "why is the water so blue?" Repeat monitoring, dialing in on the elements that were below detection limits, and obtaining information on the other feeders in the watershed are needed. Clayton State University is establishing a water testing lab based on the findings of this research. In preparation of future testing, instruments and methods are being established. We hope that this data can help communities to find the sources of the contamination.

References

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