Bronx River Breathing: An analysis of the effect of pollution on productivity in the Bronx River

BOLDUC, Georgia M., Bowdoin College, Brunswick, ME
GIBSON, Rebecca, HSUEH, Diana, McGillis, Wade, Department of Geoscience, Columbia University, New York, NY 10027

Since the 20th century, the rate of urbanization has been increasing, and today over half the global population lives in urban areas (United Nations World Urbanization Prospects, 2014). This increasing urbanization has impacted environments around the world, particularly urban waterways. In New York City, pollution from infrastructure such as CSOs (combined sewer overflows) and MS4s (municipal separate storm sewer systems) deposit high concentrations of nutrients and fecal matter into the city's surrounding waterways. The Bronx River, the city's only fresh water river, has historically suffered from eutrophication and hypoxia from these inputs. This study aimed to examine the oxygen content and characterize vegetative productivity on the Bronx River as a means to determine the effect that pollution has had on the river's metabolism. Two YSI sites, (Yellow Spring Instrument) measuring temperature, salinity, conductivity, depth, pH, turbidity, total dissolved solids, chlorophyll, blue/green algae, and oxygen content were utilized to characterize the water quality. Complementary, discrete water samples were collected to analyze water quality parameters that are inaccessible via YSI instrumentation, measuring concentrations of NO_3, PO_4 and enterococci fecal indicator bacteria. It was hypothesized that with the combination of efforts to clean up the Bronx, and the absence of CSOs upstream of the study area, that relatively low pollution levels would be recorded. It was found that though the river was highly hypoxic, both chlorophyll and nutrient concentrations were low, indicating that low oxygen concentrations were not the result of high levels of pollution and eutrophication. However, high concentrations of enterococci bacteria suggest that the Bronx is still very polluted. Hypoxic conditions within water bodies have been associated with a decreased capacity for bacteria to "fix" nitrogen and phosphorous pollutants into NO and PO4 for plant uptake (Roberts et al., 2012), and could explain low concentrations of NO3 and PO4 in the river in the context of high concentrations of enterococci bacteria. Future research should measure other nitrogen and phosphorous species to better determine if nutrient loading is occurring.