Investigating Types and Causes of Water Pollution: Three Case Studies in Upstate New York

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Abstract

The purpose of this thesis is to examine causes and trends in water pollution in three Upstate New York municipalities and the associated socioeconomic factors and the potential for environmental justice problems. Water pollution and drinking water quality is crucial to examine. The World Health Organization (2019) has reported that 2.2 billion people around the world do not have safely managed drinking water services. Water quality reports for the Town of Glenville, City of Schenectady and Town of Niskayuna, in New York State, were compared. Census data from 2019 also was used to examine race and income in these municipalities. None of the water quality reports showed violations in contamination levels, however the levels of each contaminant varied. These findings were then compared and discussed with regard to potential environmental justice issues.

Social, Economic, and Political Factors

Three factors have been explored in relation to water pollution: tragedy of the commons, socioeconomic factors, and environmental injustice. Tragedy of the commons describes the pollution that occurs in publicly owned spaces. Research has shown that much of the socioeconomic problems associated with water pollution are found in of lower socioeconomic status and people of color. Additionally, since the poverty rate for Black and Latino children and adolescents is more than double the poverty rate of non-Hispanic, white children of the same age, it is common that pollution affects these groups of people more (KCDC, 2014). The idea of environmental justice or injustice is not only that everyone has equal access to all the positive aspects of the environment and its resources, but negative as well. Additionally, it includes equal political participation in making decisions about the environment (Brisman et al., 2016).

Case Studies

The Great Flats Aquifer (Figure 1) is the only source of water that supplies the City of Schenectady, the Towns of Glenville and Rotterdam, the Village of Scotia, and the Hamlet of Rotterdam Junction. It is unconfined, meaning that there is no rock layer protecting it from potential pollution in runoff (Alpha Geoscience, 2001). Each of the municipalities in the following case studies identifies this, and therefore it is considered at high risk of being polluted.

The Town of Glenville in 2019 had the highest percentage of white residents that did not identify as Hispanic or Latino (91.4%). The City of Schenectady had the highest percentage of residents who identified as Black or African American (20.2%). The municipality with the highest median household income according to the 2019 census was Niskayuna ($110,855), in the middle was Glenville ($79,037), and the lowest was Schenectady ($45,438).

None of the municipalities exceeded health and safety standards enacted by New York State and the FDA. Lead levels (Figure 2) were highest in the Town of Glenville (0.005 mg/l). Sodium (Figure 3) was the highest in Niskayuna (93 mg/l). While sodium levels did not exceed health standards, each report mentions that those with a restricted sodium diet should not drink water over 20 mg/l, making water in all three towns potentially dangerous for those with such health concerns. Nitrate (Figure 4) was the highest in Schenectady (0.754 mg/l) and was not detected in Niskayuna's drinking water.

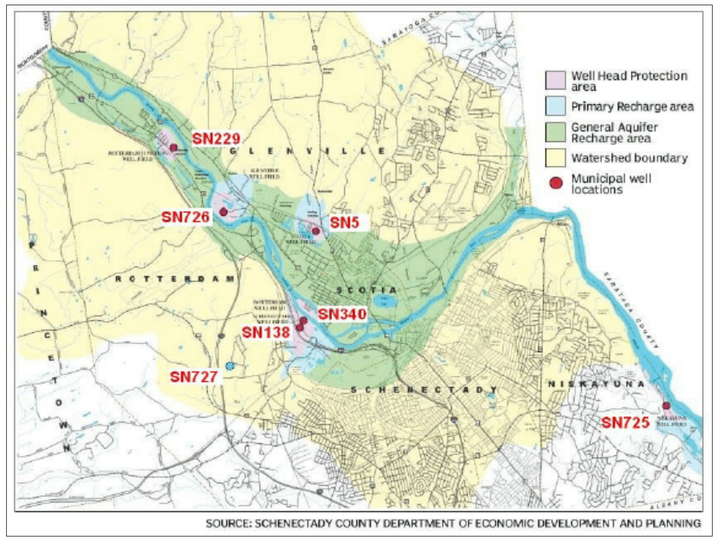

Figure 1: Map of the Great Flats Aquifer with well head protection areas in pink, primary recharge areas in blue, general aquifer recharge areas in green, watershed boundaries in yellow, and municipal well locations represented as red dots (The Great Flats Aquifer, 2018).

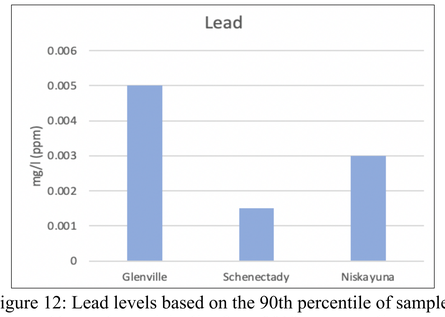

Figure 12: Lead levels based on the 90th percentile of samples measured by each municipality from 2019 water quality reports.

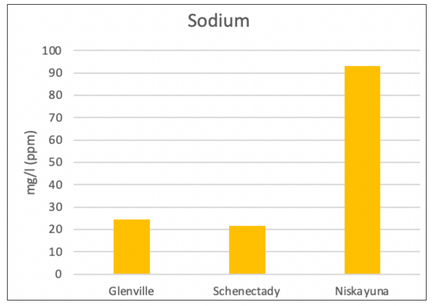

Figure 15: Sodium levels based on the 90th percentile of samples measured by each municipality from 2019 water quality reports.

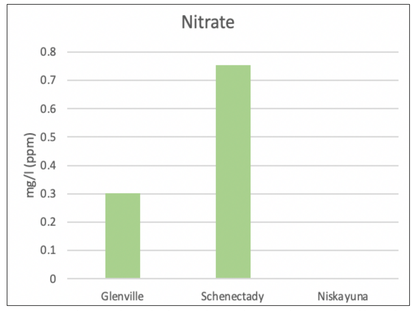

Figure 16: Nitrate levels based on the 90th percentile of samples measured by each municipality from 2019 water quality reports.

Conclusion and Policy Recommendations

Pollution and the effects of climate change affect people of color and those with a lower socioeconomic status at significantly higher rates than anyone else. By understanding water pollution and how it affects people and the environment, we can create better management strategies. It is important that each municipality investigates and acknowledges the possible sources of contamination, so they are better able to mitigate those contaminants. Additionally, the rate at which contaminants are tested for is necessary in preventing damage to the environment and residents.

Each municipality included a section in their reports on how and why residents should save water. This included saving energy and money, and checking faucets for leaks, turning off sinks and showers when they're not in use, and in Schenectady, adhering to the "lawn sprinkler ordinance." This places limits on the frequency and time in the year that residents may water their lawns in order to conserve energy and water. Every town should have this, as each of these municipalities use the same water source, so they should equally conserve water.

The source water reports of all three municipalities indicated that The Great Flats Aquifer was at a high risk of contamination. Thus, it is essential that this water is monitored to avoid contamination and damage to the environment and people. None of the municipalities tested for the same contaminants, with Glenville testing for the fewest number in their water quality report. Additionally, not every contaminant is tested for annually, because of state regulations which allow for them to be tested less frequently. Since the City of Schenectady is potentially at risk for environmental injustice issues, more funding should be provided for more frequent testing of contaminants.

Residents in all three areas are responsible for testing their own drinking water to ensure that their plumbing does not contain contaminants. This can be costly, and funding should be made available to afford these tests. This funding would be especially helpful in the City of Schenectady, where there is a higher proportion of those living in poverty.

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