

Investigating the extent of the urban stream syndrome in and around Schenectady, NY

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The urban stream syndrome refers to a degradation of urban stream ecosystems caused by channel modifications, stormwater runoff systems and an increased concentration of nutrients and other pollutants. With a projected 68% of the global population living in urban environments by 2050 [1] and about 50% of the world population living within 3 km of a freshwater body [2], the impact human settlements have on streams urgently needs to be minimized and restoration projects need to be encouraged.

The aim of this study is to investigate the extent of the urban stream syndrome in and around Schenectady, NY, by comparing urban and rural streams. A total of 49 sampling sites located along 11 different streams were monitored. Some of these sites were monitored annually during the summer for three consecutive years.

Urban streams showed a higher concentration of Na and Cl ions, attributed to the use of road salt in the North-East of the US. Urban streams also showed a higher concentration of Ca and Mg ions which can be explained by the weathering of concrete. This in turn resulted in higher alkalinity values in urban streams. Concentrations of nitrates were mostly below 3 mg/L but some streams exhibited values above 5 mg/L and on rare occasions values above 10mg/L were observed. $\delta^{15}\text{N}$ values of macroalgae from the streams were higher in urban areas. This indicates the source of nitrogen in urban areas results from animal waste runoff or leaking sewage pipes. Finally, CO_2 levels in urban streams were also higher than rural streams and reached values close to 6000 ppm. This oversaturation is consistent with the higher alkalinity values observed in urban streams.

In conclusion, urban streams in the Schenectady, NY area, collectively display the urban stream syndrome. However, there is considerable variation, with some rural streams showing higher levels of contaminants and some urban streams showing lower levels. Investigating each stream individually will be necessary to identify restoration practices.

[1] United Nations DESA (2018), un.org

[2] Kumm, De Moel, Ward & Varis (2011), *PloS one* 6, e20578.