

TORONTO'S URBAN PONDS

Monitoring water quality in Toronto's urban stormwater ponds: Assessing participation rates and data quality of water sampling by FreshWater Watchers

Andrew Scott & Paul Frost paulfrost@trentu.ca

*Between 2013 and 2015, FreshWater Watchers in Toronto, Canada collected and analyzed water quality in urban stormwater ponds. Their findings showed that stormwater ponds generally have poor water quality (elevated phosphate and nitrate concentrations and turbidity) relative to Canadian water quality standards. Macrophyte dominated ponds had lower phosphate concentrations while phytoplankton dominated ponds had lower nitrate concentrations, revealing a potentially important biogeochemical process. Scott et al. (2017) *Sci Total Environ.* 592:738-744*

Aims

With their sampling effort, citizen scientists contribute quantitative data to describe water quality and help inform its management in urban areas. This study aimed to incorporate citizen scientists into an urban water sampling project both as an opportunity to increase our knowledge of the nutrient chemistry of urban waterbodies.

Approach

Volunteers were trained in the FreshWater Watch sampling protocol at York University.

Potential sampling sites for each volunteer were selected during the training session by determining the closest sampling location to either the participant's residence or work location.

Each participant collected a water sample to monitor nitrate and phosphate concentrations following the FreshWater Watch protocol. They also took a photograph and noting the presence/absence of trash, algae, birds and macrophytes. Water samples for laboratory analysis were also collected by citizen scientists and sent to York University.

Impacts

Long term participation of citizen scientists improves understanding of ecosystem dynamics. Both recruitment of an appropriate number of participants and ongoing engagement are necessary to acquire a critical mass of information to complement scientific and agency activities.



Key results

- Eutrophication and hypereutrophication were widespread in the urban stormwater ponds of Toronto, and occurred more commonly than most undisturbed natural lakes and ponds in this region.
- Nitrate concentrations were elevated although these values are well below values that compromise drinking water ($\rightarrow 10$ mg/L) and no ponds exceeded threshold concentrations (2 mg/L N) that have been found to threaten sensitive aquatic taxa.
- Phosphate concentrations were less sensitive, but were lower where forested land was present.
- Macrophyte dominated ponds had lower phosphate concentrations while phytoplankton dominated ponds had lower nitrate concentrations, which indicates a potentially important and unstudied role of internal biogeochemical processes on pond nutrient dynamics.
- A total of 111 volunteers (~30% of volunteers) sampled water quality data after the training session with 124 individual sampling events at 29 unique locations.
- In terms of citizen science, participation was unequal between participants: a single participant was responsible for over 15% of the samples collected and the top 5% most active samplers collected more than 50% of the project's data.