

# COMBINING LOCAL AND GLOBAL DATA

## Micro and Macroscale Drivers of Nutrient Concentrations in Urban Streams in South, Central and North America

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This study explored the relationship of nutrient concentrations in 150 streams in 57 hydrological basins in South, Central and North America (Buenos Aires, Curitiba, São Paulo, Rio de Janeiro, Mexico City and Vancouver) with macroscale information available from global datasets and microscale data acquired by trained citizen scientists. The results showed that combining macroscale and microscale information helped to explain variations in phosphate concentrations, a key nutrient for limiting plant growth. [Loisselle et al. \(2016\) PLoS ONE 11: e0162684](#)

### Aims

The study aimed to explore the use of high resolution microscale data gathered by HSBC citizen scientists to improve the explanatory power of low resolution macroscale information on river stressors in stream basins in South, Central and North America.

The researchers hypothesised that nutrient concentrations are sensitive to potential drivers at both macro and microscales and that the latter would complement the former.

### Approach

#### Micro scale data

Between 2013 - 2015, FreshWater Watchers collected 2,097 datasets from 150 rivers and streams in urban and periurban areas in Buenos Aires, Curitiba, São Paulo, Rio de Janeiro, Mexico City and Vancouver.

#### Macro scale data

Global databases were used to extract data on drainage basin boundaries, rainfall, population density as well as regional results of the Adjusted Human Water Security (AHWS) index which combines key global drivers regarding water resource development (human and agricultural), pollution (nutrient loading), watershed disturbances (cropland and livestock density) and biotic factors (fishing and invasive species).

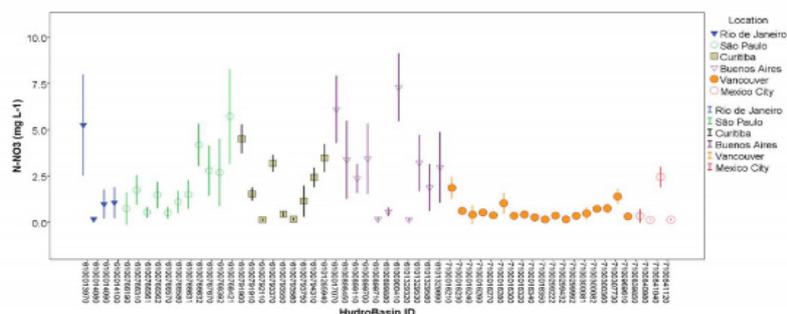
### Impacts

Results showed that microscale data (e.g. counts of the number of pollution sources) significantly improved researchers' abilities to explain variance in phosphate concentrations across sub-basins, taken separately as well as in combination with macroscale data. Integrating information acquired by trained citizen scientists with local authority datasets could therefore improve the management of smaller rivers, and help to prioritise the monitoring and management of areas at higher risk of eutrophication.



### Key results

- Phosphate is a driver of eutrophication. The threshold at which high phosphate concentrations prompt eutrophication was exceeded in more than 86% of stream basins where residential, industrial, urban/road discharge sources were identified by citizen scientists.
- The presence of bankside vegetation was associated with lower phosphate concentrations in the ecosystems studied.
- Macroscale information on nutrient loading allowed for a strong separation between basins with and without eutrophic conditions.
- In contrast, relationships between macro- and micro-variables and nitrate concentrations were limited.



Average concentrations of nitrate measured in each sampled sub-basins in Buenos Aires, Curitiba, Mexico City, Rio de Janeiro, São Paulo and Vancouver. Bars show standard errors