Fonds de recherche sur la nature et les technologies Québec

PROGRAMME DE RECHERCHE EN PARTENARIAT SUR LES CYANOBACTÉRIES 2009-2011

Responsable : Chandra Alastair Madramootoo
Établissement : Université McGill

Titre du projet : Mesures précises et approches innovantes en modélisation de la dynamique des nutriments en bassin et en plan d'eau contribuant aux fleurs des cyanobactéries
("Innovative and precision measurements and modelling of nutrients dynamics within watershed and in-lake leading to cyanobacteria blooms")

RÉSUMÉ DU PROJET

Team members : The multidisciplinary research team includes researchers from McGill (Madramootoo, Whalen), UQAM (Bird) and IRDA-Sherbrooke (Michaud), plus their partners in the Lake Champlain Research Consortium, Group de recherche interuniversitaire en limnologie (GRIL), federal and provincial agencies (AAFC, MAPAQ, MDDEP, IRDA, Lisière verte, PASCAA) and stakeholders (private landowners, agroenvironmental clubs, Corporation basin versant Baie Missisquoi). This project builds on historical datasets and long-term research partnerships.

Recurring cyanobacterial blooms in surface waters (156 lakes affected in 2007) threaten the sustainability of Quebec's waterways. Controlling point sources of phosphorus (P) from large urban centers is an effective way to reduce cyanobacteria outbreaks, but much remains to be understood about the P exported from agricultural land, forests and domestic/urban waste disposal systems in rural Quebec. There is a limit to the P loading capacity in lakes, depending on nitrogen (N) inputs from surrounding watersheds and other factors.

The objectives of this work are to use innovative analytical tools (31P-NMR spectroscopy, 15N stable isotopes) to describe the sources and chemical speciation of P and N transported from "hot spots" in the landscape to waterways during high and low flow events (field-, watershed- and basin-scale data). This information will feed into spatial mapping efforts to corroborate the spatial and temporal responses of cyanobacteria to inputs of bioavailable P and N as well as internal nutrient cycling, hence determining the P loading capacity of the lake ecosystem. Dynamic simulation models with GIS-based spatial frameworks will integrate data from four spatial scales (fields, basins, watershed and in-lake) to predict P export coefficients and lake carrying capacity. Coefficients from the Pike River basin will be validated with historical data from other instrumented watersheds in Quebec. We will deliver operational tools (models to predict P export coefficients and the P loading capacity of lakes) that have been calibrated and validated for diagnosis and action in Quebec watersheds and catchments.