

MONITORING AND CUMULATIVE EFFECTS ASSESSMENT OF THE GRAND RIVER

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WHY DID WE DO THIS RESEARCH?

Cumulative effects are not well addressed in current environmental impact assessments across Canada, and river systems are particularly difficult to assess because river characteristics are complex, and change dramatically on daily and seasonal scales. Water managers need reliable tools to predict how multiple stressors will interact and influence the health of river ecosystems. This project (2012 - 2014) advances our understanding of natural variability in a key watershed in southern Ontario – the Grand River, and the relationships among the biological, physical, and chemical processes in the river. The data was used to identify and test robust biotic indicators that can detect change resulting from watershed stressors, and to promote the development of a regional monitoring framework. The results have broad implications for water and watershed planners and practitioners that make decisions on issues that impact the management and protection of water resources.



HOW WAS THE RESEARCH CONDUCTED?

The project investigated:

- Nutrient inputs, oxygen dynamics and community metabolism
- Community composition and function of macroinvertebrates
- Fish population level responses and individual fish responses
- Controlled laboratory studies on wild and model fish

WHAT WERE THE RESULTS?

- Water quality monitoring may not be able to address the complexity of emerging chemicals.
- Stream metabolism is a robust and promising tool that integrates the whole ecosystem over a river reach scale.
- Measuring benthic macroinvertebrate function may be more sensitive in detecting environmental change. Spatial variability is strongly related to physiography, so reference sites should be located across varying regions.
- Fish populations are highly variable and difficult to separate from natural changes. Physiological endpoints can be very informative and possibly linked to specific stressors. Intersex increases near wastewater outfalls.

WHAT ARE THE IMPLICATIONS FOR THE WATERSHED AND ITS STAKEHOLDERS?

- These studies have reinforced the need for multiple indicators of biological function in order to assess change across the Grand River watershed. The indicators may need to reflect different levels of biological organization (cell and molecular responses, individual and population fitness) and trophic status.
- Understanding how these indicators respond within the context of the watershed (e.g. physiography) and are influenced by water quality and habitat (e.g., flow) will greatly improve their utility.
- In order to address the complexity of multiple stressors across watersheds, predictive approaches that move toward prospective cumulative effects assessment are needed.
- Our research is improving the understanding of these biological responses and greatly enhancing our ability to assess and predict change at the watershed scale.

For more information about this project, contact researchspotlight@cwn-rce.ca
or visit cwn-rce.ca/focus-areas/canadian-watershed-research-consortium