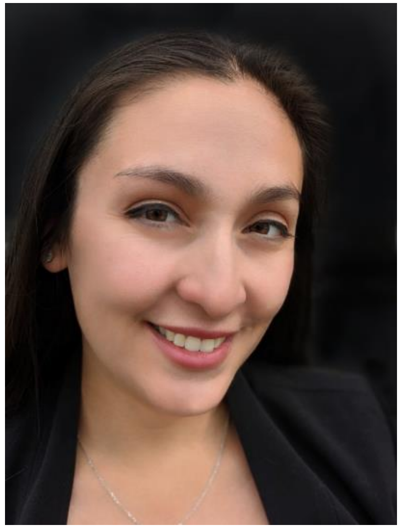
Cumulative effects monitoring in the Grand River and Lake Erie



May 19, 2021

Elaine Ho, PhD Candidate
University of Waterloo

And University of Waterloo co-authors: Simon C. Courtenay, Ziyuan (Denise) Ding, and Andrew J. Trant

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Credit: Kevin Wyatt
(Wyatt et al., 2014)

Terms

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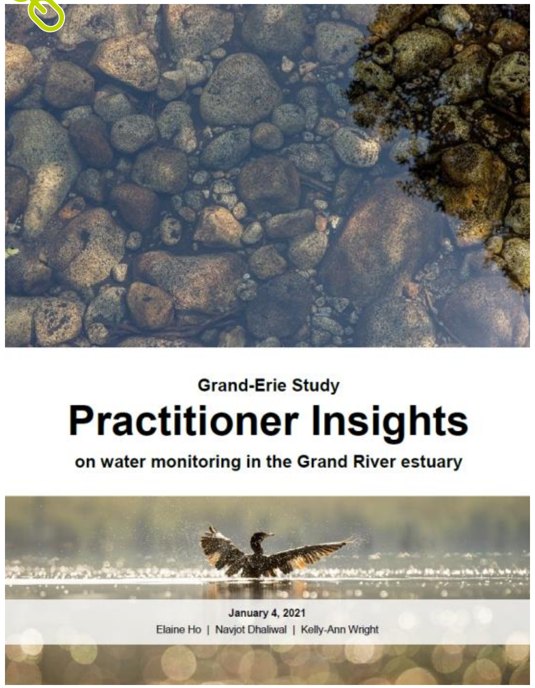
Grand-Erie Study

Practitioner Insights

on water monitoring in the Grand River estuary

January 4, 2021

Elaine Ho | Navjot Dhaliwal | Kelly-Ann Wright

Or read a brief summary of the report in *Water Canada* here.

Cumulative effects (CE): incremental and accumulating environmental changes to the biophysical, social, economic, and cultural environments caused by one or more natural and/or human activities in a region over a specified time (GRCA, 2010; Northwest Territories, 2015; CWN, 2016). CE may result from a combination of past, present and 'reasonably foreseeable' future actions (Northwest Territories, 2015).

Cumulative effects assessment: "the process of monitoring, tracking and predicting accumulating environmental change relative to established limits (Dubé, 2015, p.1)."

The study area

Why Great Lakes *Cladophora* matters

Credit: Jessica Gordon
(Osborne, 2020)

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INSIGHT

Golden Horseshoe has algae problems of its own

By Patty Winsa Data Reporter
Sat., Oct. 4, 2014 | 6 min. read

Credit: Pact Pow Citizens Group
(Winsa, 2014)

Credit: Kevin Wyatt
(Wyatt et al., 2014)

CUMULATIVE EFFECTS…

- Result from one or more natural and/or human activities in a region over a specified time…
- Are incremental and accumulating…
- Involve biophysical, social, economic, and cultural environments…

…may require collaborative, holistic, and co-creative approaches to effectively manage.

Criteria-based ranking (CBR) – supporting discussion

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MethodsX 5 (2018) 1324–1329

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journal homepage: www.elsevier.com/locate/mex

Method Article

Criteria-based ranking (CBR): A comprehensive process for selecting and prioritizing monitoring indicators

Elaine Ho

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A B S T R A C T

Resources allocated to natural resource management often fluctuate, requiring the types and numbers of parameters used in monitoring programs (e.g., indicators of ecosystem health) to be frequently reassessed. Conventional approaches to selecting monitoring indicators are often biased and non-inclusive. A new Criteria-based Ranking (CBR) process for selecting and/or prioritizing indicators was tested in the Muskoka River Watershed (Ontario, Canada). The CBR process is based on two environmental assessment tools, Simple Weighted and Leopold matrices. It incorporates environmental components and criteria for assessing each indicator, which generate a score per indicator. The process tested in this study was concluded to be an effective way to prioritize and/or select environmental monitoring indicators. A different set of indicators emerged when a common set of criteria was used to assess monitoring indicators. Benefits of the CBR process include:

- Standardization of indicator selection process with less bias and lower cost (e.g., time and human resources).
- Indicators that are representative of the community and more relevant for decision-making (e.g., more resilient to socio-political change).
- Adaptability: (1) to other goals, e.g., selecting from a list of Valued Ecosystem Components (VECs), and (2) to any context through localized scoring criteria. Easily integrated into existing practice.

A R T I C L E I N F O

Method name: Criteria-based ranking (CBR) process (for indicator selection/prioritization)

Keywords: Valued ecosystem components (VECs), Indicators, Monitoring, Watershed monitoring, Water monitoring, Indicator selection process

Article history: Received 16 August 2018; Accepted 6 October 2018; Available online 23 October 2018

Or read the full paper from the exploratory research here.

- Practitioner workshop (December 2020) to further develop the CBR process from 2016.
- Collectively determined 22 criteria for selecting an indicator for cumulative effects monitoring and scored 18 current indicators against them.
- Top 5 scores:
  - Total phosphorus
  - Dissolved oxygen
  - Temperature
  - *Cladophora* biomass (directly measured)
  - Nitrate

CUMULATIVE EFFECTS WORKSHOP SUMMARY

1. What is currently being measured to understand the issue of nutrients? What do these indicators tell us?
2. What indicator or set of indicators should be monitored for understanding cumulative effects related to nutrients and/or *Cladophora*?
3. How would you use these indicators in cumulative effects assessment?

Also, a manuscript is currently being prepared for publication.


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Summary report

January 2021

Workshop:
Indicators for assessing cumulative effects of nutrients on *Cladophora*
(December 7, 2020)

Elaine Ho, Denise Ding, and Navjot Dhaliwal

Elaine Ho: e23ho@uwaterloo.ca

Other things we tried… and something we didn't

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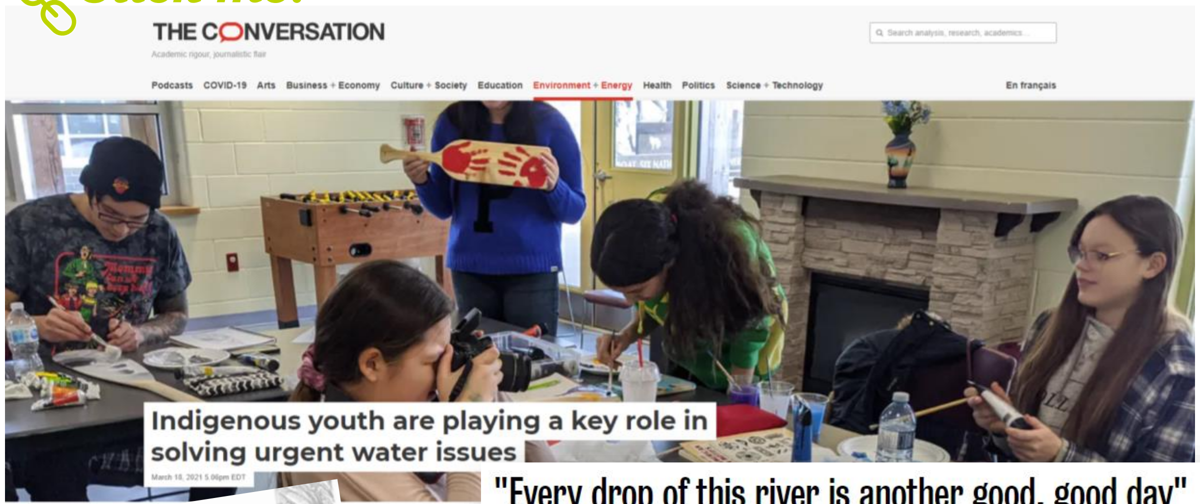

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"Every drop of this river is another good, good day"

WEDNESDAY, AUGUST 19, 2020

By Elaine Ho

Nothing about a river is straight, nor is its management straightforward. I quickly learned from my exploratory research, evaluating monitoring indicators in the Muskoka River Watershed, that the supposedly simple task of generating a list of environmental indicators for monitoring watershed health was more about social equity, communication, organizational capacity and partnerships, than it was about managing the watershed – at least at that stage in the monitoring program's development. The question 'what do we measure to understand watershed health' quickly evolved into

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- Visualizing social-ecological system features (e.g., people, stressors, effects, pathways) may be key to achieving a common understanding and constructive discussion regarding CE.
- Share and receive knowledge in various ways: **collaborative watershed analysis** (e.g., systems mapping).
- Systems mapping examples: *Cladophora* growth model (Higgins, 2005), adapted DPSIR model for eutrophication and organic pollution (Kristensen, 2004), and ISO 31000-2009 risk analysis bow-tie (Creed et al., 2016).

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Collaborative watershed analysis process

1. Verify the problem (e.g., hearing from diverse perspectives, an undesired effect has been observed).
2. Define the system's spatial and temporal boundaries based on the observed effect and its 'valued component'.
3. Collectively consider which combination of interactions may be at play.
4. Collaboratively create a systems map or visualization to illustrate interactions, including potential management responses where possible.
5. Modify visuals over time as knowledge of interactions grows.

Note: this may be useful to implement alongside predictive modelling.

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Thank you!

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