

Indigenous Peoples-related environmental research within the basin of the Laurentian Great Lakes: A systematic map protocol

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Abstract

1. The North American Great Lakes Basin is the homeland for many First Nations, Métis and Native American Tribes. The terrestrial and aquatic ecological systems within this multinational region, which is of spiritual, cultural and subsistence significance to a diversity of Indigenous Peoples, are facing several natural and anthropogenic pressures. While there are many current and past research efforts and projects to address those pressures, the nature and range of environment-related projects involving Indigenous Peoples or organizations remains unknown. This gap in knowledge presents a unique opportunity to identify and map past and current environmental and ecological research within the Great Lakes involving Indigenous Peoples.
2. A systematic search strategy will be applied to identify and capture peer-reviewed publications that pertain to past and current environmental research within the Great Lakes basin that involve or are connected to Indigenous Peoples, following the procedures outlined in this systematic mapping protocol. Publications that pertain to environmental and ecological research with, for and by Indigenous Peoples within the Great Lakes, as determined by the use of suitable keywords, will be retrieved from four proposed online bibliographic platforms and databases. Searches will only include peer-reviewed publications in the English language.
3. Final captures of the search results will be screened in two stages to identify potentially relevant papers. This will take place through (1) title and abstract screening and (2) full-text analysis. Following the completion of the screening process, remaining papers will be coded and analysed through a narrative synthesis approach and descriptive statistics will be conducted. Environmental research captured through this systematic protocol will be geospatially mapped using the ArcGIS mapping software.
4. It is anticipated that the information obtained from the resulting systematic map will be beneficial for identifying gaps in environmental research to support and inform future initiatives for environmental research planning, policy and

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decision-making with, for and by Indigenous Communities within the Great Lakes basin.

KEYWORDS

ecological systems, environmental research, Great Lakes, Indigenous Peoples, North America, policy, research gaps, systematic map

1 | INTRODUCTION

1.1 | Background

Approximately 185 First Nations, Métis or Native American Tribes' communities reside and have traditional Territories and homelands around the Great Lakes Basin which spans a shoreline of 17,000 km between Canada and the United States (GLOS, 2021). Indigenous Peoples living within the Great Lakes Basin have close subsistence, economic, spiritual and cultural ties with the water, land and ecosystems of the Great Lakes (Lukawiecki et al., 2021). These ties are protected by Treaty rights (Hudson & Ziegler, 2014). The Great Lakes basin continues to face increased anthropogenic pressures and has become an area of active environmental research focused on various issues including ecological and environmental health, environmental risk assessment, climate change impacts and ecosystem restoration (IJC, 2008; Lynch et al., 2010; McKenna Jr, 2019; Wiener et al., 2012).

There is a growing need to respectfully engage and include Indigenous Peoples around the Great Lakes, whose livelihoods and culture are being impacted by environmental challenges (e.g., the ecological consequences of climate change on aquatic and terrestrial environments) into all levels of environmental decision-making processes. Respectful engagement with Indigenous Peoples in all levels of environmental decision-making processes is complex and involves an awareness of cultural knowledges, practices and protocols related to the land and waters of the Great lakes, as well as understanding of Indigenous ways of relationality and consensus building. The nature of environmental decision-making processes considered here include the following: the identification of needs to be met and/or addressed, the gathering of information to address these needs, the decision of which plan to implement moving forward, and finally, implementation and evaluation of such plan(s). Since the late 1990s, the Great Lakes Science Advisory Board has expressed the need for the engagement and inclusion of Indigenous Peoples and, more recently, Indigenous Knowledge in research, monitoring and decision-making surrounding the Great Lakes (IJC, 2006, 2008). Furthermore, the Smart Great Lakes Initiative (SGLI), a joint effort between the United States and Canada which was launched in 2021, provides an opportunity to improve the understanding of Great Lakes ecosystems through innovative technology-based research (GLOS, 2021). In an effort to address the ongoing push for inclusion of Indigenous Peoples and Knowledge and ensure equity and environmental justice, the SGLI identified the need to understand the priorities of Indigenous Nations and communities around the Great Lakes basin.

However, there is a lack of information regarding what environmental research around the Great Lakes basin has taken place (i.e., where, when, how and by who) that involves Indigenous communities who have powerful connections and rights to this multinational resource, which is shared by the United States and Canada as well as about 185 Indigenous communities, Nations and Tribes with sovereign rights. From a research and policy perspective, a knowledge of the Indigenous footprint in environmental research around the Great Lakes Basin is significant as it can provide insight into the environmental issues that are being prioritized as well as those issues for which additional financial and other resources are required.

The results of the proposed systematic map, informed by the identified peer-reviewed literature, will support the effort to recognize the extent to which multiple knowledge systems are informing environmental management actions and policy for the Great Lakes basin, in the United States and Canada. For the purpose of this study, the papers that are captured and considered relevant to the research objectives and components (Sections 1.3 and 1.4) will be inclusive of the five Great Lakes (Lakes Superior, Huron, Michigan, Erie and Ontario) as well as major and connecting tributaries as determined through Treaty maps and watershed boundaries. The resulting systematic map will be used to support the identification of research priorities of Indigenous communities and groups. These findings, while limited to the identified peer-reviewed literature, can act as a preliminary step towards aligning academic, funding and government agencies with current initiatives and interests of Indigenous Peoples in the region as well as identifying research gaps, providing recommendations for a more inclusive future initiative planning for the Great Lakes basin.

1.2 | Primary research question

What are the main topics addressed by environmental research involving Indigenous communities and organizations around the Great Lakes basin, within available peer-reviewed literature?

1.3 | Objectives of the review

1. Identify the range (e.g., year and discipline) and nature (e.g., Indigenous cultural and linguistic group, geographical location and species/object of study) of past and ongoing environmental

research in the Great Lakes region with, for and by Indigenous communities and organizations within published literature.

2. Identify gaps in past and ongoing environmental research in the Great Lakes with, for and by Indigenous communities and organizations that are published in the peer-reviewed literature.

1.4 | Components of the primary research question

For this systematic mapping process, components of the primary research question include the following:

1.4.1 | Population

The included peer-reviewed studies will focus on Indigenous Peoples and Nations surrounding the Great Lakes as well as major tributaries and linking water bodies.

1.4.2 | Study intent

Articles that focus on a research project will be included.

1.4.3 | Geographical scope

Articles that focus on the Great Lakes (Lakes Superior, Huron, Michigan, Erie and Ontario) as well as major and connecting tributaries as determined through Treaty maps and watershed boundaries will be included.

2 | MATERIALS AND METHODS

The proposed systematic map will be guided by a Collaboration for Environmental Evidence (CEE) Guidelines and Standards for Evidence Synthesis in Environmental Management Synthesis framework (CEE, 2018) and will follow standards and guidelines of RepOrting standards for Systematic Evidence Syntheses (i.e., completion of ROSES form; Supporting information 1) (Haddaway et al., 2018).

2.1 | Searching for articles: Search strategy

The scope of the resulting map will be limited to peer-reviewed publications. Therefore, grey literature such as books, government documents, reports and conference proceedings will not be eligible for capture. Although no initial language restriction will be applied to the search, only documents written in English will be considered as translation capacity within the research team is limited. The publication dates of the captured papers will be restricted to the coverage

dates of the bibliographic databases and platforms as well as the date of final capture.

2.1.1 | Search string development

To perform a systematic mapping of the literature, several options of words for a search string will be determined using the three research parameters: Indigenous, geography/location and environmental research (Supporting information 2).

Initially, Google Scholar was used for the purpose of becoming familiar with and gathering multiple keywords and synonyms relating to the research components. The use of multiple synonyms is intended to increase the sensitivity of the search string to ensure, to the best of our ability, that the diversity of Indigenous Peoples and Nations, geographical locations and projects are included within our search. Combinations of keywords were used to develop testable search strings using Boolean operators (AND, OR, NOT). General observations regarding the search capacity of the online database and/or platform were made and noted during this process, such as citation export capacity, number of synonyms which could be added to the search string, and to what extent multiple Boolean operators could be applied.

Due to the search and capture constraints of Google Scholar, we opted to use the online platform of bibliographic sources, Web of Science, to further refine and test keyword combinations. Within Web of Science, we continued to identify, test and refine the use of keywords and combinations using Boolean operators (AND, OR, NOT) as well as the use of special characters such as truncation and wildcard characters (*), and specific word combinations or exact phrases ("") (Table 1). During the search string and keyword testing process, when the inclusion of a keyword resulted in the capture of additional sources, that keyword was then added to the proposed search string.

TABLE 1 Proposed search string for the literature search using the online bibliographic platform, web of science

```
Search string
(Indigenous OR Indian OR Indians OR Native* OR Aboriginal* OR
tribe* OR tribal* OR Traditional OR Nation OR Nations OR
Mohawk)
AND
("Great Lake*" OR "Lake Erie" OR "Lake Huron" OR "Lake Ontario"
OR "Lake Superior" OR "Lake Michigan" OR "Lake Saint Claire"
OR "Lake St. Claire" OR "Saint Claire River" OR "St. Claire River"
OR "Georgian Bay" OR "Saint Lawrence River" OR "St. Lawrence
River" OR "Detroit River" OR "Grand River")
AND
(monitor* OR research* OR steward* OR initiative* OR assess* OR
examin* OR explor* OR approach* OR review* OR stud* OR
project* OR investigat*)
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The asterisk (*) is a wildcard character that is used to broaden a search by allowing for the capture of variations of a word (e.g. investigat* includes investigate, investigation, investigating), while the quotation marks (") are used to capture exact phrases.

A preliminary scoping process has been completed to determine whether any similar studies reviewing a broad range of environment-related research for, by and with Indigenous communities and organizations within the Great Lakes have been done. The following online bibliographic sources: Google Scholar, OMNI, Bibliography of Native North Americans, International Bibliography of the Social Sciences and Web of Science were searched. The authors found no similar systematic maps previously published in the peer-reviewed literature.

2.1.2 | Online bibliographic sources

To enhance the breadth of content captured, multiple online databases and bibliographic platforms will be used. Trent University Omni subscription will help to access those databases and platforms. The final search string developed in Web of Science will be appropriately adapted to each database. Limitations and content for each database and platform will be considered when determining whether to include or exclude a database or platform; for example, the batch export capacity, the search focus such as nature and science, and the range of publication dates that are included in the database or platform. The search will be conducted until the publication capture capacity has reached saturation. All searches will be conducted in the English language. The following online bibliographic platforms and databases will be used for this literature search:

1. ISI Web of Science (Core Collection): multidisciplinary online bibliographic platform consisting of various subject areas including science, social sciences and arts & humanities.
2. EBSCOhost Bibliography of Indigenous Peoples in North America: a bibliographic database covering all aspects of Indigenous Peoples in North America culture, history, and life and including topics such as archaeology, multicultural relations, gaming, governance, legend and literacy.
3. ProQuest International Bibliography of Social Sciences: a bibliographic database for social science and interdisciplinary research.
4. EBSCOhost Academic Search Elite: a multidisciplinary database which offers full text for scholarly journals covering several areas of academic study including social sciences, sciences and humanities.

Hand searching will be performed by randomly scanning the reference sections of relevant peer-reviewed articles to ensure a high level of inclusivity within the scope of the systematic map. The authors of some of the publications may be contacted as a follow-up.

The comprehensiveness of the search protocol will be assessed using a multi-step process. This process will consist of (1) using multiple bibliographic databases to encompass and increase the coverage of multiple subject fields, (2) using a wide array of search terms, (3) applying no time limitation on the search and (4) using a collection of benchmark articles ($n = 20$; [Supporting information 3](#)). In all, 20 benchmark articles were identified using the hand search

method. These benchmark articles are representative of the diversity of terms (i.e., Indigenous, Great Lakes, Monitoring) included in the search string protocol. It is expected that the search protocol will capture the benchmark articles. If the benchmark articles are not captured with the search protocol, the search protocol will be revised as necessary.

The publications that are captured will be batch exported from each database to Endnote 20 Referencing Software. Endnote is the preferred software for this research as it allows for group collaboration as well as the creation of a database that can be subsequently exported to Microsoft Excel for further analysis. Within Endnote, duplicate publications will be removed, and the process of screening titles and abstracts will begin.

2.2 | Article screening process and study eligibility criteria

2.2.1 | Article screening

The publications that are captured will be batch exported from each database to Endnote 20 Referencing Software. Endnote is the preferred software for this research as it allows for group collaboration as well as the creation of a database that can be subsequently exported to Microsoft Excel for further analysis. Within Endnote, duplicate publications will be removed, and the process of screening titles and abstracts will begin.

Final captures of the search results will be screened in two stages to identify potentially relevant papers: (1) title and abstract screening and (2) full-text analysis.

2.2.2 | (Stage 1): Title and abstract screening

This stage will require the assistance of two independent reviewers to determine the relevant papers as indicated by the objectives of this review. Having two persons collaborate for this process will help to ensure that the established criteria is being upheld, and increase validity for exclusion/inclusion of papers with a focus that may be challenging to classify. A third reviewer may be consulted if the first two reviewers are unable to agree on whether to include or exclude a publication.

Screening will continue by examining the title and abstract for each study. Studies that fully or partially align with the inclusion criteria (see eligibility criteria below) will proceed to stage 2 of the screening process.

2.2.3 | (Stage 2): Full-text analysis

This stage will involve a manual search and review of entire papers. During this process, an inclusion/exclusion decision list will be developed which will then inform the removal of irrelevant publications.

Articles excluded at the full-text stage will be provided as an additional file, along with reasons for exclusion, with the published systematic map.

Before the abstract and title screening as well as the full-text screening, consistency checking will be performed to account for different interpretations of the inclusion criteria (i.e. inter-rater reliability testing). Consistency checking will be performed for a subset (5%) of the captured articles. Using the search criteria (i.e., Indigenous, Great Lakes, Monitoring), two reviewers will independently review the same subset of randomly selected articles. Consistency checking would involve the two reviewers comparing their results and discussing any arising disagreements on inclusion/exclusion of papers. If disagreements cannot be reconciled and if the level of agreement is below c. 80%, based on a Kappa test, an independent and experienced/senior reviewer within the research team will screen the articles (Alexander et al., 2019). The full screening process will continue when all inconsistencies have been reconciled. Consistency checking ensures that researchers are consistent in their application of the inclusion/exclusion criteria, as well as tests the reliability of the inclusion/exclusion criteria.

2.3 | Eligibility criteria

2.3.1 | Population

The included peer-reviewed studies will focus on Indigenous Peoples and Nations surrounding the Great Lakes as well as major tributaries and linking water bodies. For the purpose of this review, the researchers use the term Indigenous Peoples to refer to Peoples or Nations (First Nation settling on the land prior to the arrival of European Settlers; Bartlett et al., 2007). It is challenging to ensure that all Indigenous Peoples and Nations around the Great Lakes are captured in this scoping review process as there is a diversity of Indigenous Peoples along the Great Lakes (i.e., the multiple Anishinaabe and Haudenosaunee groups e.g., Ojibway and Mohawk). The researchers included multiple synonyms for the word Indigenous in an effort to ensure that all groups were captured.

2.3.2 | Study intent

The resulting systematic map will include papers which aim to conduct or have conducted environmental research. For the purpose of the map, environmental research will be defined broadly as any planned and/or purposeful study relating to the environment.

2.3.3 | Geographical scope

The geographical context for this systematic map includes the five North American Great Lakes as well as major tributaries and linking

water bodies/rivers in close proximity to Treaty and community lands for First Nation, Métis, Native American Tribes and Tribal Organizations. It is challenging to define the study boundary as the Great Lakes basin watershed spans two countries—the United States and Canada. This study aims to overcome that challenge by defining the study boundary. For the purpose of this study, lands and waters extending up to 500km from the shorelines of any of the five Great lakes will be included. Only papers written in the English language will be included and papers included will be limited to the range of database date coverage.

Reviewers within the research team who are authors on articles that were captured within the review process will not be allowed to make decisions regarding the inclusion of those papers. Independent reviewers within the research team will lead the inclusion/exclusion process in such instances.

2.4 | Study validity assessment

It is not the intention of the systematic map to assess or critique the quality (i.e. replicability, validity or credibility) of captured papers.

2.5 | Data synthesis and presentation

2.5.1 | Data coding strategy

Following Stage 2 of the screening process, remaining studies for potential inclusion will be exported from Endnote 20 into Microsoft Excel. The articles will be coded using a customized Microsoft Excel template (Supporting information 4). The template was designed to reflect and capture key information about the articles based on various themes/categories including: bibliography information, geographical location of study, population (Indigenous Peoples) and purpose of undertaking (i.e., environmental-related research or monitoring project). The results will be compiled and extracted in Microsoft Excel. The authors of some of the publications may be contacted as a follow-up when there is missing bibliographic information.

To avoid misrepresentation of articles while extracting data from identified articles, missing information will be coded/recorded as Unspecified.

2.5.2 | Study mapping and presentation

Major focus areas of research involving Indigenous Peoples within the Great Lakes will be coded, analysed and presented/reported through the application of a narrative synthesis approach, using thematic content analysis and descriptive statistics (Saldaña, 2021). Results of the analysis will be presented in tables and figures. Priority themes/focus of previous and current environmental

research as well as under-researched topics/research gaps will also be highlighted through the use of a framework-based synthesis using structured matrices (Alexander et al., 2019; Dixon-Woods, 2011; McKinnon et al., 2016).

The studies will be geospatially mapped using the ArcGIS mapping software. The map will illustrate areas within the Great Lakes which have been the focus of environment-related research by First Nation, Métis, Tribes, Nations and tribal organizations based on the peer-reviewed articles captured for the review process.

The final output will include a published systematic map article as well as the resulting MS-Excel database of final included studies and their meta-data.

3 | DISCUSSION

The aim of this study is to create a protocol for a resulting systematic map which captures, within the peer-reviewed literature, research focusing on the North American Great Lakes basin for, with and by Indigenous communities and organizations. Findings from this review can inform environmental decision-making, research and funding within the United States and Canada; and support the effort to recognize the need for multiple knowledge systems in informing environmental management and policy within the Great Lakes basin.

AUTHOR CONTRIBUTIONS

The manuscript was drafted by Marsha Serville-Tertullien, Emma Pirie and Mary-Claire Buell; Chris Furgal and Barbara Moktthewenkwe Wall provided critical comments and revisions. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST

All authors declare that they have no competing interests.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

This article does not contain data.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supporting information 1. ROSES *pro forma* for systematic map protocols.

Supporting information 2. Search terms and strategies.

Supporting information 3. Benchmark list of candidate studies for inclusion.

Supporting information 4. Coding template.

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