

Final Report

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Towards consideration for an Indigenous-directed sister Smart Great Lakes Initiative (I-SGLi)

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Executive Summary

Several significant threats such as climate change, invasive species, and environmental contaminants continue to face the Great Lakes ecosystem and represent challenges to its health and environmental management. Current monitoring infrastructure in the Lakes is roughly 5 to 10 years behind that of other coastal regions and as such, it is critical that all efforts are made to access and draw upon available resources and energy to upgrade and expand the capacity to gather, understand and disseminate information on the Lakes in support of effective policy and decision making.

Indigenous communities, knowledge holders and practitioners must have space to truly contribute to an enhanced understanding of this ecosystem. It is the land with which they have lived in relationship with for thousands of years and Indigenous Knowledge such as that held by Nations around the Lakes has been shown to make great contributions and innovation to understanding of ecosystems around the world, to the benefit of all of society.

This project conducted an environmental scan on recent and ongoing Indigenous-related research and monitoring projects and initiatives in the Great Lakes available in the peer-reviewed and grey literature. This inventory of activity was then supplemented by informal conversations with key representatives of Indigenous communities, organizations and Nations with knowledge of research and monitoring efforts in their region. This learning was then used to develop and disseminate an online survey to a diversity of Indigenous community, organization and Nation representatives around the Lakes. This survey was designed to gather their perspectives on past and future research and monitoring activities, data and information needs and priorities, and interests in collaboration among Indigenous partners that might inform the development of Indigenous led opportunities for cooperation on Great Lakes research and monitoring.

The peer-reviewed and grey literature searches identified a significant level of research and monitoring activity around the Lakes on a variety of topics. While there are differences in geographic region of emphasis and topics of focus represented in the two knowledge bases, they report a high level of Indigenous related (engaged, directed, partnered, relevant) research and monitoring on several environment and health related subjects. This work is often conducted in partnership between Indigenous communities and outside parties (different levels of governments and academic institutions being the most common). Conversations with community/Nation/organization representatives about research and monitoring activities they were aware of around the Lakes, identified important limitations in a literature-only review of these activities in the region. As was shared by key individuals, other sources of research funds than those requiring or encouraging public sharing of results, findings and raw data are often used by Indigenous community/organizations and Nations to support important research in their Territories. As some of this work is sensitive and valuable to communities and Nations, it is not

made public, and therefore the literature-informed view of the landscape of research and monitoring activities is very likely an underestimate of the quantity of activity and may be a misrepresentation of the topical emphasis or focus of work being done and of significant to Indigenous peoples. Further, perspectives shared during these conversations were indicative of the importance of consideration for issues pertaining to Indigenous data management and sovereignty in this and other environmental work.

The literature search activities and conversations were then used to design and disseminate an online survey to a wider representation of Indigenous community/organization and Nation representatives around the Lakes. The survey provides greater detailed information on past community/Nation/Organization participation in Great Lakes research and monitoring. While having a Lake Superior and Huron focus in responses, it indicates a past and future interest or prioritization in research and monitoring on species at risk/endangered species and fish in the Great Lakes. Survey respondents reported that the vast majority of past work has been conducted in collaboration and not solely by an individual community/Nation/Organization. The most common partners for this work with Indigenous communities are university researchers, followed by government representatives at various levels. Interestingly, the most common source of funding for this work was not University or academic sources but government sources. Greater than half of all respondents indicated challenges to this work in the past included finding experienced and trustworthy partners to conduct the work and finding adequate sources of funding. These are both challenges that may benefit from support by an outside entity or trusted partner of Indigenous groups in various regions around the lakes. Issues of data protection, management, and sovereignty are critical going forward, however the majority of participants indicated an interest in discussing ways to collaborate with other Indigenous groups around the Great Lakes on research and monitoring in the future. These findings are supportive of further discussion and exploration with Indigenous groups around the Lakes regarding ways that GLOS may support their future research and monitoring interests and needs.

Overarching Goals of the Project

Project Background

This project grew from the Great Lakes Observing System's (GLOS) Smart Great Lakes Strategic Plan (2020-2025) and initiatives, and conversations with GLOS Co-Chairs, Dr. Twiss (US) and Dr. Currie, (Canadian), and others at GLOS. The strategic plan states there is a critical need to “combine resources and energy to upgrade and expand our capacity to collect, analyze, and communicate information about the Great Lakes” (p. 4). In a 2021 conversation, Drs. Twiss and Currie, identified that the Smart Great Lakes Initiative (SGLi) lacks contributions from a clear and strong Indigenous voice. Our discussions acknowledged the importance of being able to draw upon and learn from all available knowledge and expertise, including the First Peoples of Great Lakes region the Native American Tribes in the US, and First Nations and Métis peoples in Canada. GLOS recognized the opportunity for co-learning between Indigenous and non-Indigenous knowledge holders and practitioners and the opportunity to contribute to a greater understanding of the Great Lakes and the changes these ecosystems and the Peoples relying upon them are experiencing now and into the future.

Project Objectives

As an initial step in creating understanding to inform future efforts to facilitate collaboration and opportunities for co-learning, this project set out to achieve the following objectives:

1. Review the current landscape of work and initiatives pertaining to Indigenous engagement and information needs associated with the Great Lakes Ecosystem.
2. Gather perspectives on First Nations', Tribes' and Metis' interests in and needs to engage in a collective Indigenous directed SGLi sister initiative.

Approach

Summary

The approach to meeting the project objectives included three activities. First an organized search and review of the current landscape of published and accessible work and initiatives associated with the engagement of Indigenous communities and organizations in Great Lakes related research and monitoring was conducted using a systematic mapping protocol. Results of the peer reviewed and grey literature searches were then complemented by informal conversations with a limited number Indigenous and non-Indigenous practitioners. These practitioners were identified through the literature and web searches or known to project team members. Findings of the literature searches and conversations informed an online survey. This survey was distributed to all identified communities, organizations and practitioners to gather perspectives on research and monitoring priorities, partnerships developed, funding for this work

in the Great Lakes region challenges experienced in this work, and future data needs and priorities.

Project team and roles

This project was co-managed by Chris Furgal and Barbara Moktthewenkwe Wall of the Indigenous Environmental Institute (Trent University), and Research Associate, Mary-Claire Buell of the IEI and Collective Environmental. In addition, project team members included Research Associate Marsha Serville-Tertullien, graduate student Research Assistant Emma Pirie, and undergraduate student Research Assistant Logan Lazore.

Serville-Tertullien, Pirie, and Lazore conducted the peer reviewed literature and grey literature search and analysis of results. Buell, Serville-Tertullien and Pirie established the initial search process and search string. Pirie and Serville-Tertullien were responsible for developing the systematic map protocol for the peer reviewed literature search. Serville-Tertullien and Lazore were responsible for the iterative process used in the grey literature search. Furgal and Wall reviewed all work and provided guidance and advice in the process.

Conversations with practitioners were conducted by Buell and Furgal to fill in gaps found in the literature searches, and to inform the survey.

The project team contributed to the draft of the survey; the survey was developed by Furgal with input from Wall and Buell. Survey data compilation and analysis is on-going through the end of July 2022, and is being conducted by Furgal, Wall, and Buell.

Methods

Activity 1a: Peer-reviewed literature search

The systematic map protocol followed standards and guidelines of Reporting standards for Systematic Evidence Syntheses (ROSES) (Haddaway et al., 2018).

Search strategy and search string development

A standardized search strategy was applied to capture the most relevant peer reviewed publications from four online databases. Publications that pertained to environmental research and monitoring with, for, and by Indigenous Peoples within the Great Lakes were captured using keywords (i.e., several options of words for a search string were determined using the three research parameters: Indigenous, geography/location and monitoring and research-based projects) that were initially identified using Google Scholar (see below). Multiple synonyms for each parameter were used with the intent to create a search string that best represented the

diversity of Indigenous Peoples and Nations, geographic locations, and projects within the scope of the study. Keyword combinations were used to develop testable search strings using specific words and characters known as Boolean Operators (AND, OR, NOT). Characteristics of online databases e.g., search capacity, citation export capacity, number of synonyms which could be added to the search string, and the extent to which multiple Boolean operators were noted.

Following this process, an online bibliographic database, Web of Science was further used for the identification, testing, and refinement of keywords and combinations using Boolean Operators and other special characters such as truncation and wildcard characters (*), and specific word combinations or exact phrases (“”) (Table 1). Keywords, which generated any number of relevant sources pertaining to the research question, were added to the search string.

Only peer reviewed publications in the English language were searched. A two-stage screening process was applied to the search results: (1) at the level of title and abstract; and (2) at the level of full text through manual review. A narrative synthesis approach and descriptive statistics were conducted through a process of coding and analysis, on the remaining papers.

Table 1. Search string used in the peer-reviewed literature search of Web of Science publications.

<p>Search string</p> <p>(Indigenous OR Indian OR Indians OR Native* OR Aboriginal* OR tribe* OR tribal* OR Traditional OR Nation OR Nations OR Mohawk)</p> <p>AND</p> <p>("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")</p> <p>AND</p> <p>(monitor* OR research* OR steward* OR initiative* OR assess* OR examin* OR explor* OR approach* OR review* OR stud* OR project* OR investigat*))</p>
<p>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</p>

Web-based search

The search strategy was applied to multiple databases to maximize the extent and variety of content captured. The search string was finalized using Web of Science and appropriately adapted to other online databases. During this process, the characteristics of each database, including limitations and content (e.g., the batch export capacity, the search focus such as nature, science and the range of publication dates that are included in the database), were noted to determine which databases would be used.

The following databases were used for this peer-reviewed systematic mapping protocol:

1. ISI Web of Science (Core Collection)
2. EBSCO*host* Bibliography of Native North Americans (BNNA)
3. ProQuest International Bibliography of Social Sciences (IBSS)
4. EBSCO*host* Academic Search Elite

This protocol has been submitted for publication in a peer-reviewed journal.

Activity 1b: Grey Literature search

Search String Development:

Developing a search string for the grey literature search was an iterative process. A preliminary search was conducted to identify a list of all Indigenous Nations and Peoples within 500 kms of the shoreline of one of the five Great Lakes. This area, referred to throughout this report as the “Great Lakes region” was used to identify communities and research and monitoring activities for inclusion in this project. Search results from a combination of treaty maps from the Government of Canada and maps archived in the Trent University library were used to compile a list of nations. The search for Indigenous Treaties obtained from maps helped to inform a more complex search for community projects and reports.

Due to deficiencies in the search capabilities of google, a simple search string was used. A search string was developed using two main components: Nation/Organization name and Great Lakes Projects

Web-based Search:

Searches were performed in the Google web-based search engine. The search string was used to capture relevant information/articles/reports from the communities’ websites and other relevant specialist or target websites such as The Great Lakes Restoration Initiative (GLRI), Environment and Climate Change Canada, Great Lakes Acoustic Telemetry Observation System (GLATOS) and USEPA. The websites were manually screened for relevance. The first 150 sources (i.e the first 15 pages of results) were screened for relevance, based on an inclusion/exclusion criteria. After the initial screening we checked every 20th source for relevance until reaching 500 sources. The search results were collected and relevant data from the searches were extracted and compiled in a Microsoft Excel database. Searches were performed in English only.

Activity 2: Supplemental conversations with community/nation/organization representatives

Participant Identification:

Representatives from Indigenous Tribes, First Nations and Métis communities and Tribal organizations within the Great lakes known to Buell, Furgal and Wall and some identified during the grey literature search process (see Activity 1) were contacted by Buell and Furgal for an informal conversation.

Supplemental Conversation Process:

These conversations were used to identify and fill in information gaps in the literature search developed database of publications and projects (see Appendix A for Supplemental Conversation Guide). The duration of the conversations were approximately 20 minutes. Notes were taken by either Buell or Furgal and are summarized in the Findings (Activity 2) section of this report.

Activity 3: Online Survey methods

Participant Identification:

Practitioners and/or representatives from Indigenous Tribes, First Nations and Métis communities and Tribal organizations within the Great Lakes identified during the grey literature search process (see Activity 1) were sent the online survey and invited to participate in order to gather perspectives from a broader representation of communities/organizations/Nations surrounding the Great Lakes.

Survey conduct:

Survey questions were developed by Furgal with input from Wall and Buell. They were based on data categories identified from the literature review and feedback from the supplemental conversations. Qualtrics online survey software was used to create, distribute, and analyze the survey. The survey was distributed to 47 recipients identified from the grey literature database, by team members based on prior knowledge and online web based searches for community and organizational addresses of Indigenous groups surrounding the Lakes, as well as recommendations from GLOS representatives. A copy of the survey is included as Appendix B.

Informed consent preceded any survey questions in the online process and upon completion of the survey participants were asked if they would like to receive an honorarium for their time. All responses, including those providing contact information to receive an honorarium, are reported in an anonymous form. No specific community or Nation identification is included in the reporting of results. A total of 20 participants responded to the survey in June and July of 2022.

Findings/Results

Summary

In the past two and a half decades, there has been significant engagement with Indigenous communities/Nations/organizations of the Great Lakes region in a diversity of research arenas. The majority of the research projects captured in the literature searches are related to Lake Superior, followed by Lake Michigan, Lake Huron, Lake Ontario, and Lake Erie (note: the number of projects captured by grey literature search is higher for Lake Erie than Lake Ontario).

Indigenous Knowledges and ways of knowing, and western scientific knowledges and processes are used collaboratively on approximately 82% of projects identified through the peer-reviewed literature search (knowledges and processes were not consistently specified in the grey literature).

Research topics are diverse and range from fish, mammal, bird, reptile (grey literature only), aquatic insects (grey literature only), contaminants, soil, vegetation, invasive species (grey literature only), weather and/or climate, land use and management, water use and management, to education and awareness, and health risk assessment (these later two topics appear in grey literature only).

Research project partners identified in the literature searches are diverse and include academic, federal government, state or provincial government, municipal government (grey literature only), non-profit organization, Indigenous community/nation, industry (grey literature only), and citizen science (grey literature only) organizations and individuals.

It is important to note that the peer-reviewed and grey literature searches captured one representation of the level and focus of research engaging Indigenous communities/Nations/organizations and their priorities/concerns. Not all such research is publicly shared through peer-reviewed publications or grey literature. Therefore, conversations with key informants and a survey of practitioners identified in the grey literature search are essential in enhancing an understanding of the research landscape. It is important to note that findings from these conversations and the survey may also be limited.

Consideration of Indigenous communities/Nations/organizations-defined priorities and data governance issues is important for future I-SGLI discussions.

Activity 1a, b: Peer-reviewed and Grey Literature Search and Review

Results of the peer and grey literature sources are presented and discussed in graphic and narrative form. Raw data of the inventory of peer reviewed and grey literature sources is included in the link on the last page of this report (“*I-SGLi-Final database from Peer-reviewed and grey literature searches*”). The parameters selected to present results emphasize key findings of the reviews. They are chosen for their association with the project objectives (e.g. date of conduct, geographic location, topic of focus, type of partner engaged in the research or monitoring etc.) The parameters included are identified in Table 2 below.

Table 2. Selected parameters of peer reviewed and grey literature sources used in the presentation of literature review results.

Parameter	Peer-reviewed literature/ Figure number	Grey literature/ Figure number
Date	Publication year Figure 1	Year of publicly reported Project start Figure 10
Indigenous cultural/linguistic group	Figure 2	Figure 11
Indigenous Community	Communities involved in research and/or monitoring projects Table 3	Active Research Locations - Community name and number of publicly reported projects Table 4
Geographic distribution	Lake, tributary associated with publication Figure 3	Lake, tributary of publicly reported projects Figure 12
Focus of Study	Figure 4	Not included (this information was not always specified in the grey literature)
Species or object of study	Figure 5	Figure 13
Role of community in research	Figure 6	Not included (this information was not always specified in the grey literature)
Method of data collection for IK and WS	Figure 7	Not included (this information was not always specified in the grey literature)
Knowledge System used in data analysis	Figure 8	Not included (this information was not always specified in the grey literature)
Project Partners	Figure 9	Figure 14

Peer-reviewed Literature Search and Review

To examine the nature and extent of identified and gathered peer-reviewed articles, the following section provides key findings pertaining to selected study characteristics (Table 2).

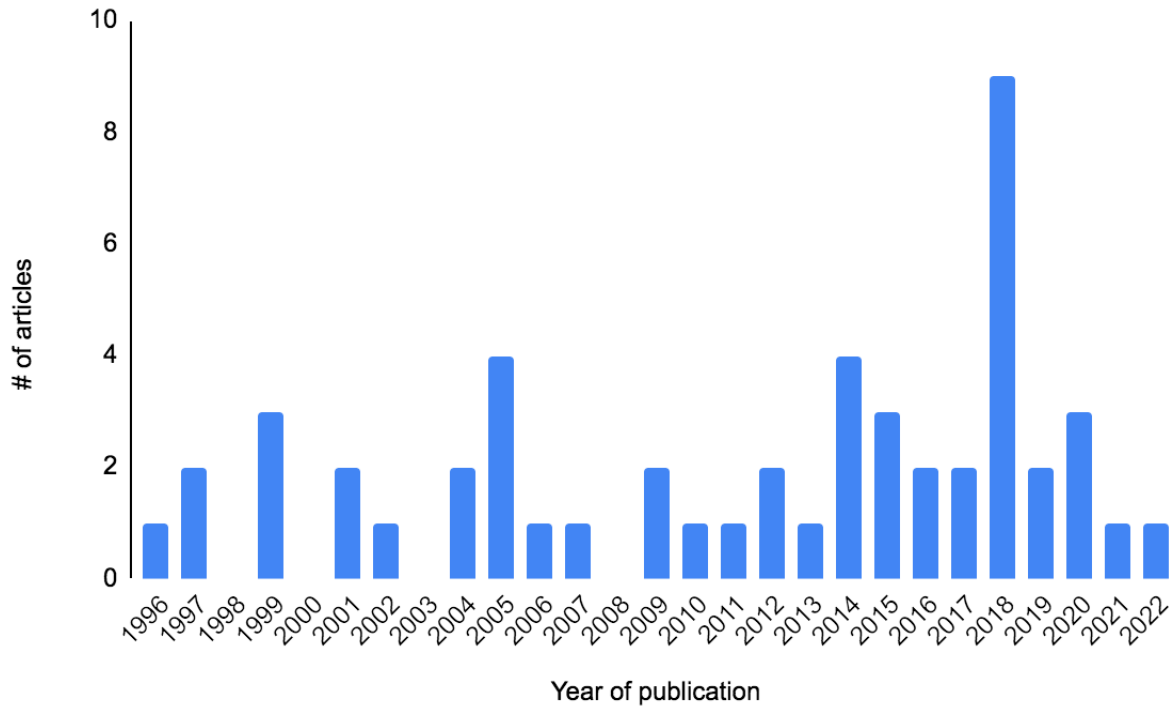


Fig. 1. Number of peer-reviewed articles by publication year focusing on Indigenous related research or monitoring activities in the Great Lakes (n=51).

Among the studies that conducted research and/or monitoring projects with, for or by Indigenous communities, the majority (>50%) have been published since 2010 with most of these (84%) being published between January 2014 and February 2022 (Fig. 1). The greatest number of articles published was in 2018 (n=9).

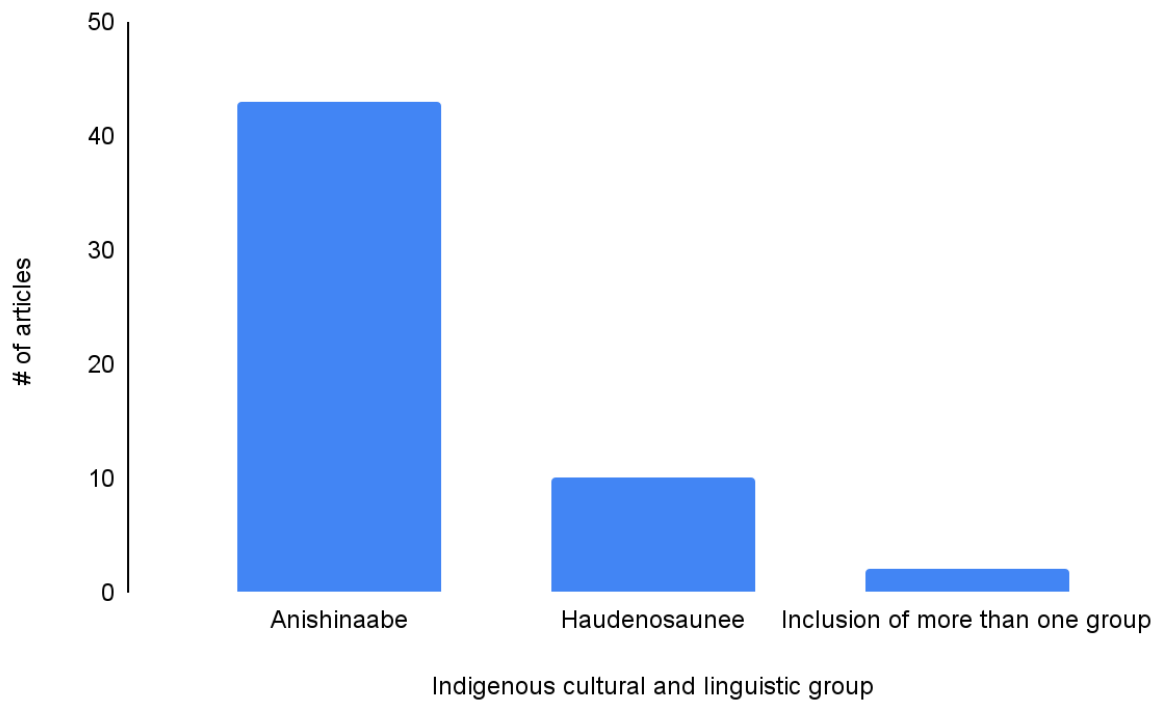


Fig. 2. Number of articles identified in the peer-reviewed literature search by Indigenous cultural and linguistic group (n=51).

Over 80% of articles included in the peer-reviewed search had conducted research and/or monitoring projects with, for or by Anishinaabe communities (43/51). Twenty percent of projects had been conducted with, for or by Haudenosaunee communities (10/51) (Fig. 2). Few articles (<15%) included more than one of these two cultural and linguistic groups (2/51, 4%) in the same project.

Table 3. Communities identified in the peer-reviewed literature search.

Community	Number of articles (n=51)
Bay Mills Chippewa Indian Community	11
Akwesasne (Mohawk Council of Akwesasne & Saint Regis Mohawk Tribe)	11
Bad River Band of Lake Superior Chippewa Indians	10
Sault Ste. Marie Tribe of Chippewa Indians	10
Grand Traverse Bay Band of Ottawa and Chippewa Indians	8
Little River Band of Ottawa Indians	8
Little Traverse Bay Bands of Odawa Indians	8
Lac du Flambeau Band of Lake Superior Chippewa	6
Menominee Indian Tribe of Wisconsin	5
Keweenaw Bay Indian Community	4
Lac Courte Oreilles Band of Lake Superior Chippewa Indians	4
Red Cliff Band of Lake Superior Chippewa	4
Sokaogon Chippewa Community/Mole Lake Band of Lake Superior Chippewa	4
Fond du Lac Band of Lake Superior Chippewa	3
Lac Vieux Desert Band of Lake Superior Chippewa	3
Mille Lacs Band of Ojibwe	3
Six Nations of the Grand River	3
St. Croix Chippewa Indians of Wisconsin	3
Grand Portage Band of Chippewa	2
Unspecified	5
15 other communities (i.e., Aamjiwnaang First Nation, Mohawks of Kahnawà:ke, Oneida Nation of the Thames, Wiikwemkoong Unceded Territory)	1
Inclusion of more than one community	24

Among the articles published on research and/or monitoring projects with, for or by Indigenous communities, the majority (>50%) specified which Indigenous community/communities were included (90%) while 10% of papers did not specify which Indigenous community/communities were involved (Table 3). Of the articles which specified the Indigenous community/communities (n=46), 52% included more than one group, 24% included the Bay Mills Indian Community, the Mohawk Nation at Akwesasne (24%), the Bad River Band of the Lake Superior Tribe of Chippewa Indians (22%), and the Sault Ste. Marie Tribe of Chippewa Indians (22%). Other communities identified were the Little Traverse Bay of Ottawa Indians (17%), the Sokaogon Chippewa Community/Mole Lake Band of Lake Superior Chippewa (9%), and the Six Nations of the Grand River (7%), the Grand Portage Band of Chippewa (4%), the community of Aamjiwnaang First Nation (2%) and Oneida Nation of the Thames (2%).

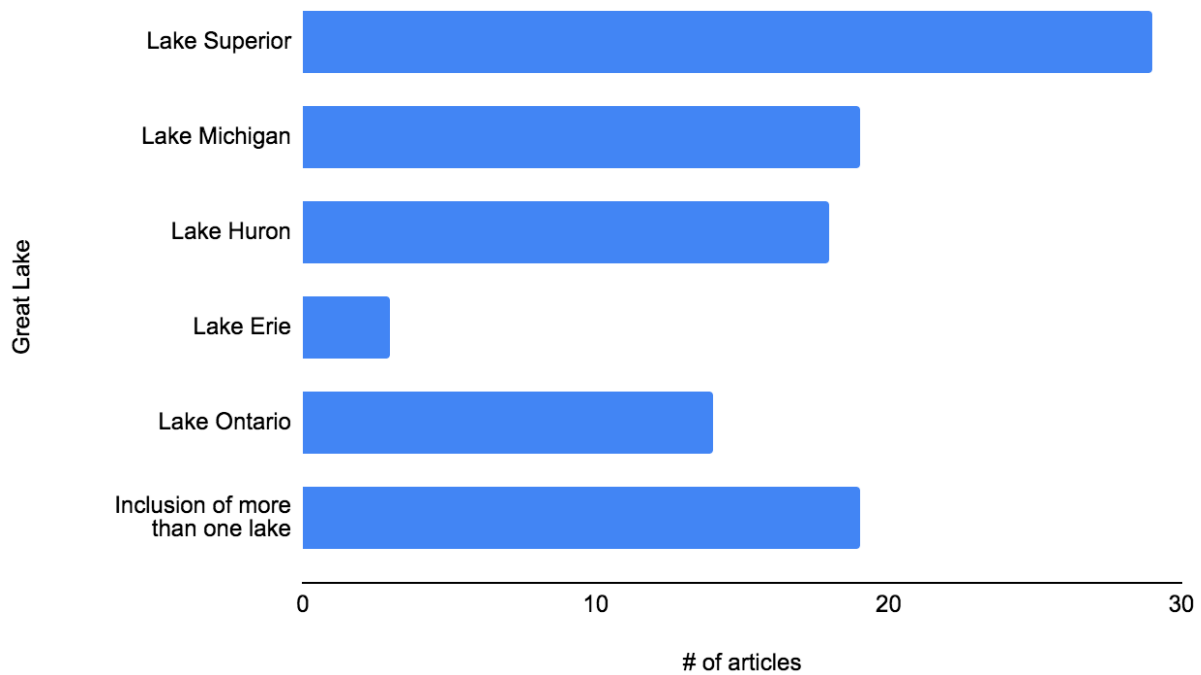


Fig. 3. Geographic distribution by lake of identified articles (n=51).

Over half of the published articles reported work that was carried out in communities on and/or surrounding Lake Superior (29/51, 57%) (Fig. 3). Over a quarter of included articles were from research conducted in communities situated on and/or surrounding Lake Michigan (19/51, 37%) and 35% on and/or surrounding Lake Huron (18/51). A substantial portion (15-30%) of articles were carried out in communities on and/or surrounding Lake Ontario (14/51, 27%) while few articles reported work (<15%) taking place on and/or surrounding Lake Erie (3/51, 6%). A total of 37% of articles reported research that included more than one lake (19/51).

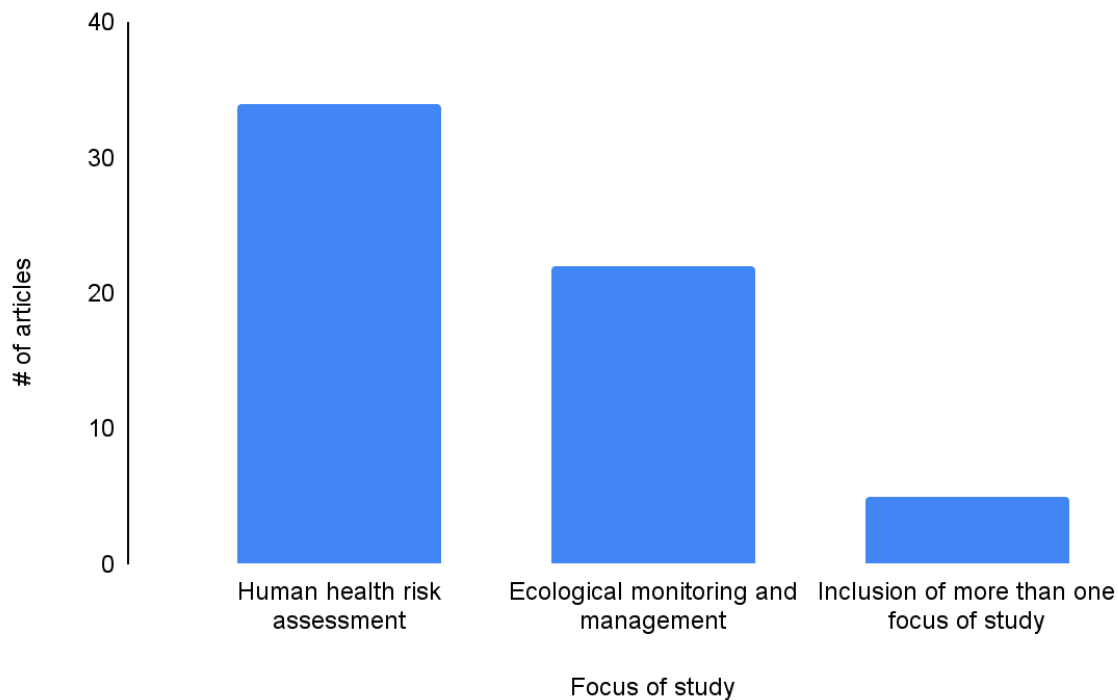


Fig. 4. Number of peer-reviewed articles focus of study (n=51).

Each article that conducted research and/or monitoring with, for or by Indigenous communities was characterized by the major research and/or monitoring focus of study (Fig. 4). The majority (> 50%) of articles concentrated on conducting human health risk assessment(s) (34/51, 67%) while just less than half focused on ecological monitoring and management on and/or surrounding the community (22/51, 43%). Meanwhile, just 10% of the articles included more than one focus of study (n=5/51).

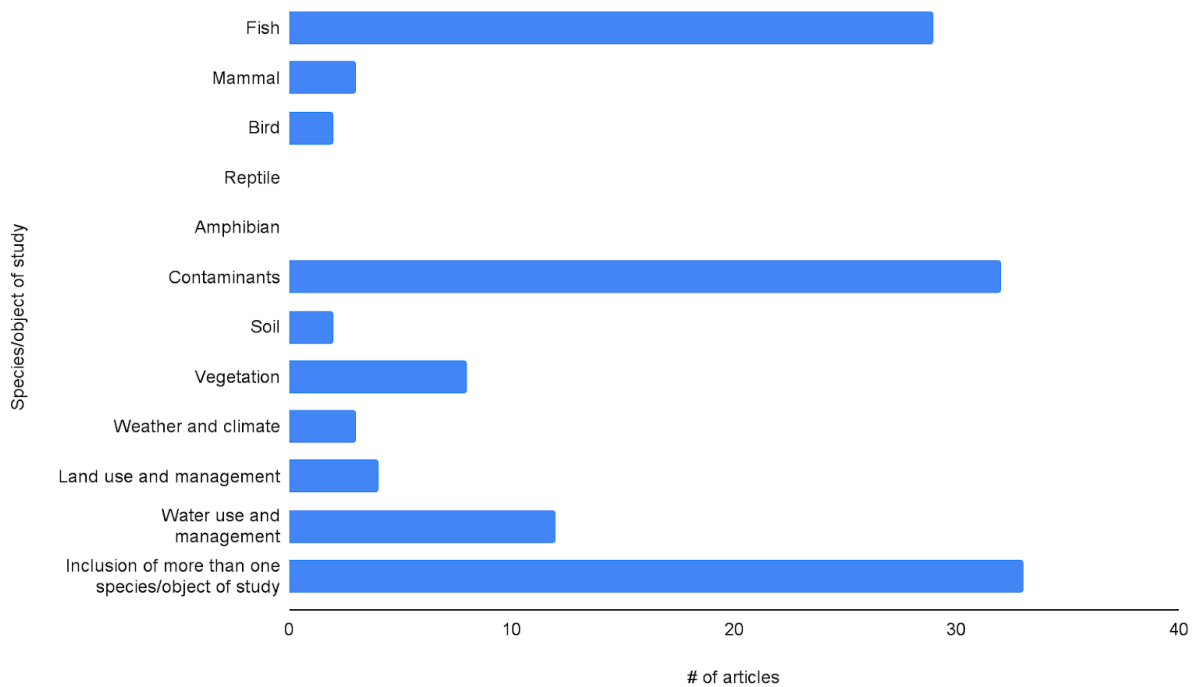


Fig. 5. Number of articles identified in peer-reviewed search separated by species/object of study (n=51).

Articles identified in the peer-reviewed search were also characterized by species and/or object of focus of study (Fig. 5). The majority of papers reported on studies focusing on contaminants (32/51, 63%) and fish (29/51, 57%). A substantial, but smaller portion (15-30%) of articles reported on work on water use and management (12/51, 25%) or vegetation (8/51, 16%). Few articles (<15%) focused on land use and land management (4/51, 8%), mammals (3/51, 6%), weather and climate (3/51, 6%), birds (2/51, 4%) or soil (2/51, 4%). Over half of the articles included more than one species and/or object of study (33/51, 65%).

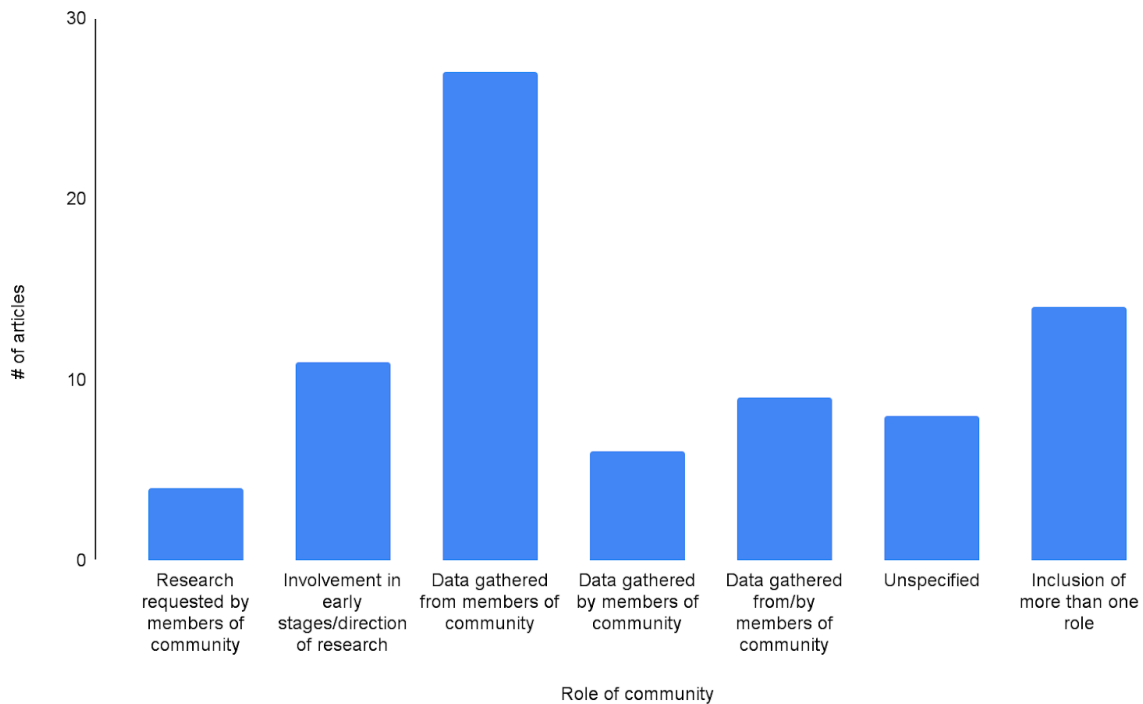


Fig. 6. Number of articles identified in the peer-reviewed search separated by role of community in the study (n=51).

Each article that conducted research and/or monitoring with, for or by Indigenous communities was characterized by the role of the community/communities within the research and/or monitoring project (Fig. 6). The majority (<50%) of articles reporting gathering data from community members (27/51, 53%). Almost a quarter of articles stated that community members were involved at the early stages of the research and/or monitoring project (11/51, 22%) and 18% had data gathered both from and by members of the community involved in the study or project (9/51). Other identified roles of the community in the projects also included data being gathered by community members (8/51, 12%) and research requested by the community (4/51, 8%). Slightly more than one-quarter of all articles (28%) included more than one role (14/51).

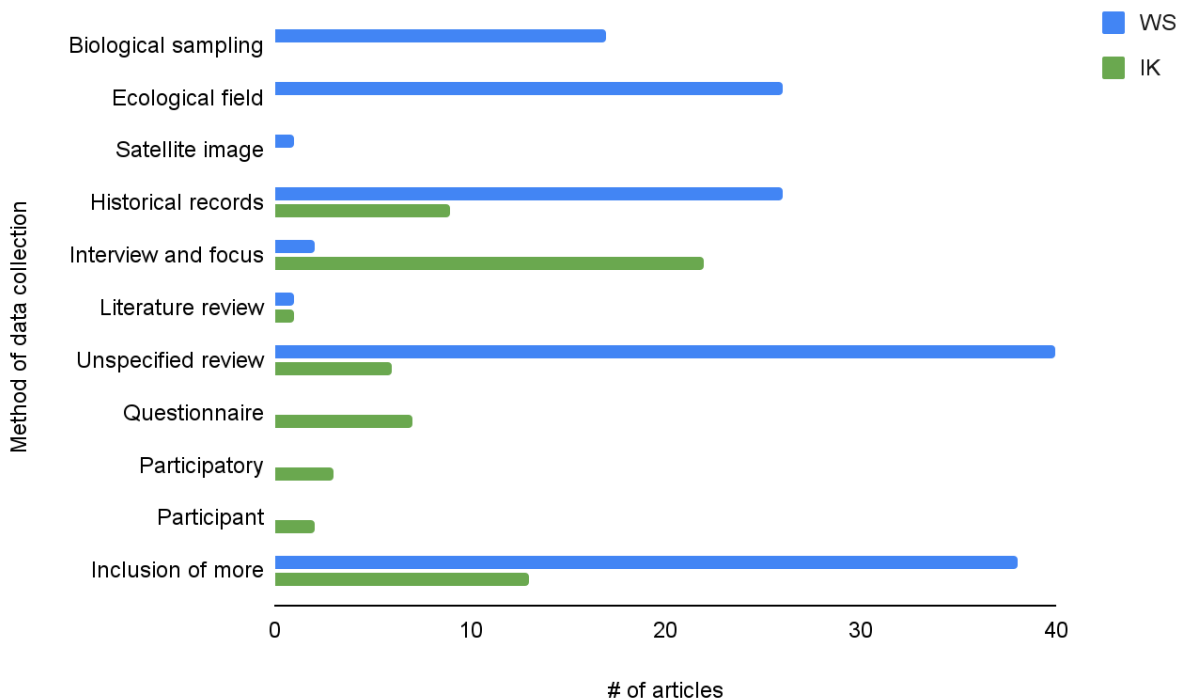


Fig. 7. Number of articles identified in the peer-reviewed search grouped by methods of western science (WS) and Indigenous Knowledge (IK) data collection (n=51).

Figure 7 shows data collection methods utilized to gather WS and IK. The most widely utilized method of gathering WS in the studies was through an unspecified review of the literature (40/51, 78%) followed by gathering data via historical records (26/51, 51%), ecological field survey/assessments (26/51, 51%) and biological sampling (17/51, 33%). Other WS data collection methods included interviews (2/51, 4%), literature reviews (1/51, 2%) and satellite image classification (1/51, 2%). The majority (75%) of articles utilized more than one data collection method to gather WS (38/51). In comparison, interviews and focus groups were widely utilized as a method of gathering IK (22/51, 43%) in the studies identified and included in the literature review analysis. The second highest proportion of IK data collection methods reported were historical records (9/51, 18%) followed by questionnaires (7/51, 14%). Other methods drawn upon to gather IK included an unspecified review of literature (6/51, 12%), participatory mapping (3/51, 6%), participant observation (2/51, 4%) and a literature review (1/51, 2%). A quarter of articles utilized more than one method in order to gather IK (13/51).

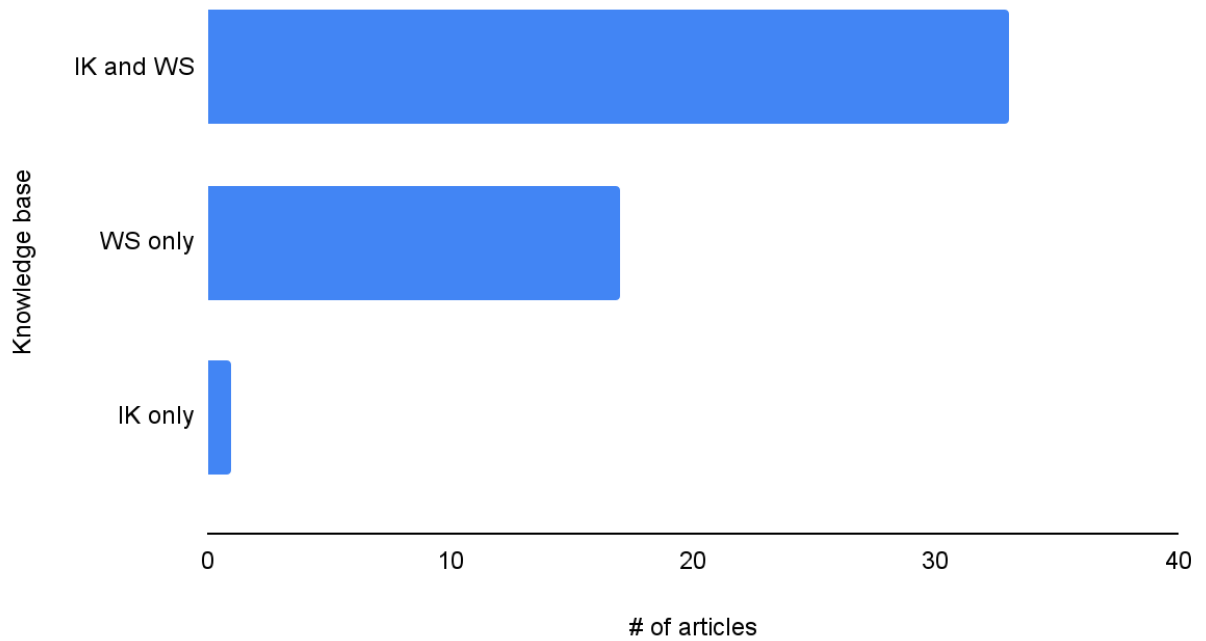


Fig. 8. Number of articles identified in the peer-reviewed search separated by knowledge base used in the study (n=51).

Among the articles gathered and analyzed for the literature review, 65% used both IK and WS in the data collection and/or analysis stage of their research (33/51) while 33% used only WS (17/51) and only 2% used only IK (1/51) (Fig. 8).

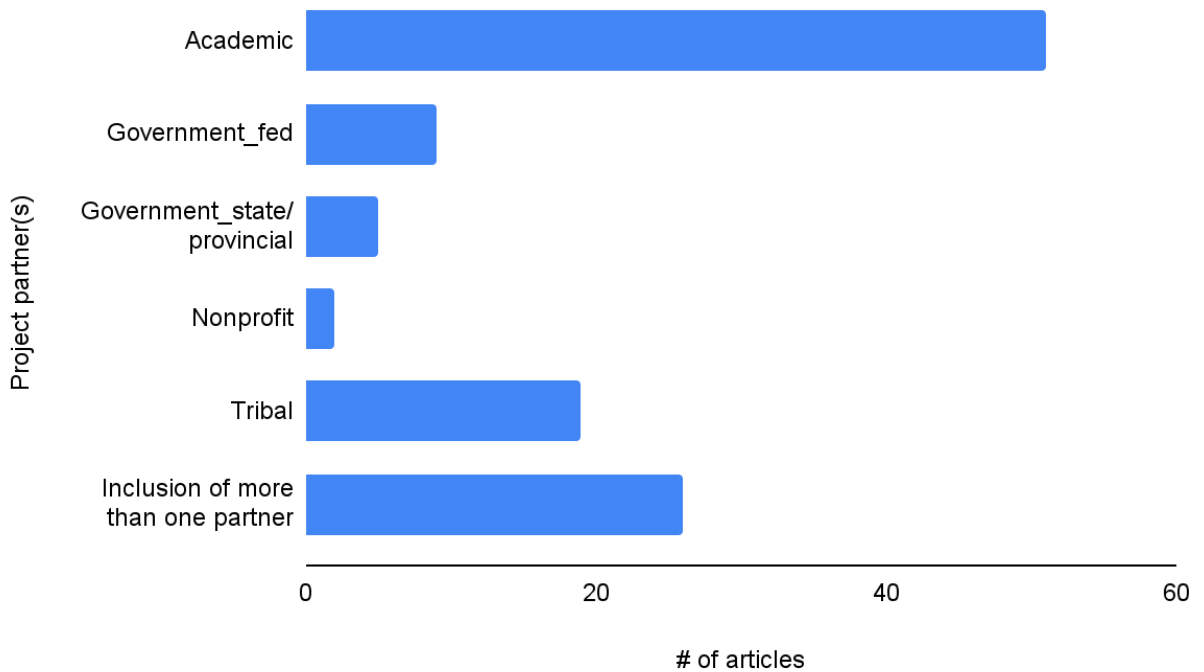


Fig. 9. Number of articles identified in the peer-reviewed literature search separated by project partner(s) involved in the work (n=51).

All articles in the peer-reviewed literature search included academic project partners. This was followed by 37% of projects that included Tribal project partners (19/51) (Fig. 9). A substantial, but smaller portion (15-30%) of articles included federal governments as partners (9/51, 18%) while few articles (<15%) included state/provincial governments (5/51, 10%) and nonprofits (2/51, 4%) partners. Just over half of the articles included more than one project partner (26/51, 51%).

Grey Literature Search and Review

This section presents an overview of the metadata or characteristics of research and monitoring projects that were extracted from the grey literature search for Indigenous-Peoples related projects surrounding the Great Lakes. For the grey literature review, emphasis was placed on number of projects and not, the number of project output products such as reports or other forms of communication.

Many of the same categories used to characterize and describe the peer-reviewed literature were not applied to the grey literature because this information was often not specified on websites (e.g. publication year, discipline of study, role of community in research, methods of data collection and knowledge system used for data collection and analysis). As a result, some difference in parameters used to describe the projects appears in the results below.

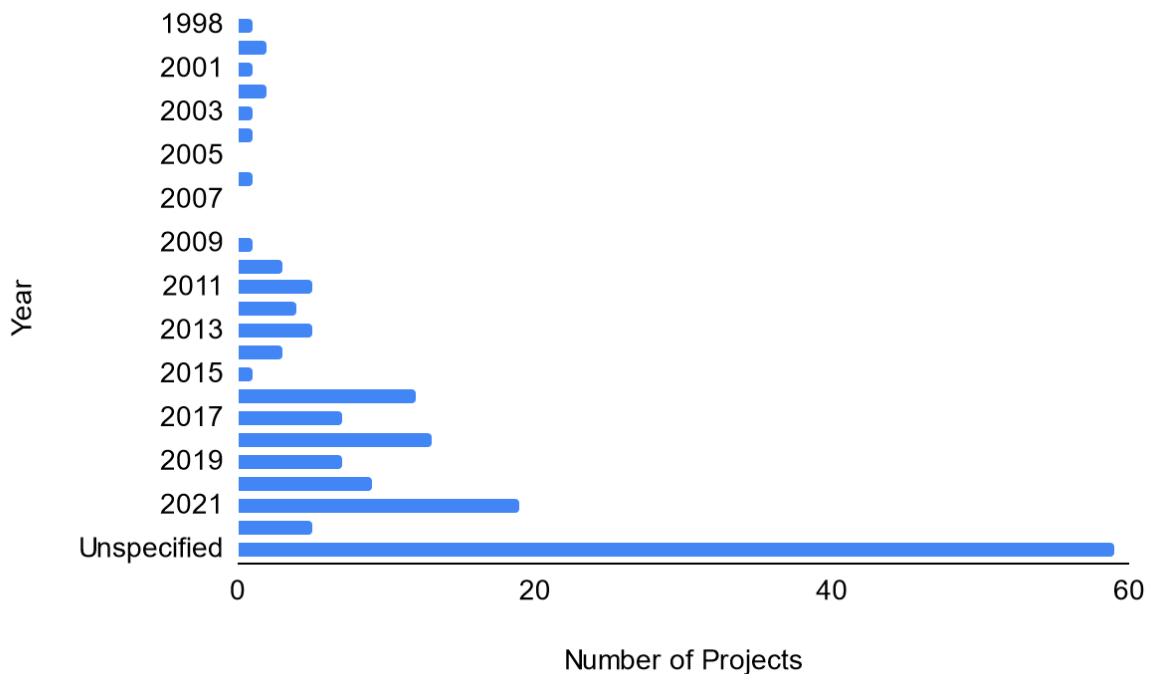


Fig. 10. Number of publicly reported Indigenous-Peoples related monitoring and research within the Great Lakes region by reported project start year (n= 162).

The majority (96/162, 59%) of the publicly reported projects that met the review inclusion criteria had a start year of 2010 or later (Fig 10). Indigenous-Peoples related monitoring studies and research projects within the Great Lakes region prior to 2010 were rarely retrieved through

this systematic literature search. For 36% (59/162) of the literature, the project start year was unspecified. In some cases projects were described as ongoing.

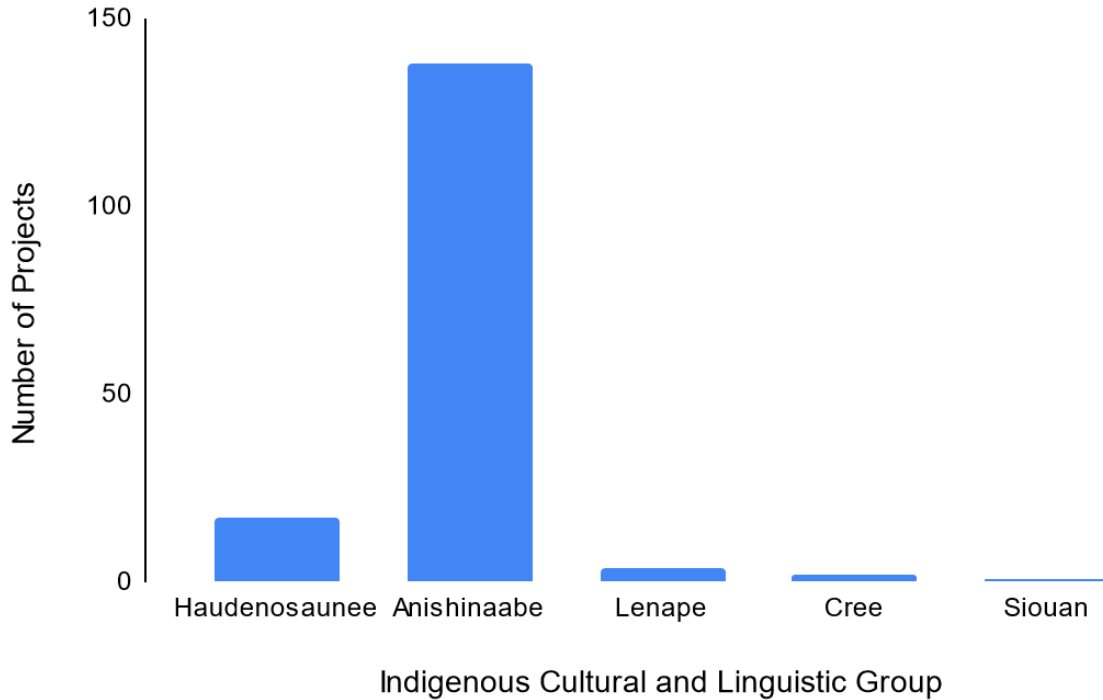


Fig. 11. Number of grey-literature sources identified reporting projects based on Indigenous cultural and linguistic group (n = 162).

Over 85% of the research and/or monitoring projects identified through the grey-literature review were with, for or by Anishinaabe communities (1378/162) and 11% with, for or by Haudenosaunee communities (17/162) (Fig. 11). Few articles (<10%) were with, for or by Lenape (4/162, 2%), Cree (2/162, 1%) or Siouan (1/162, 1%) communities.

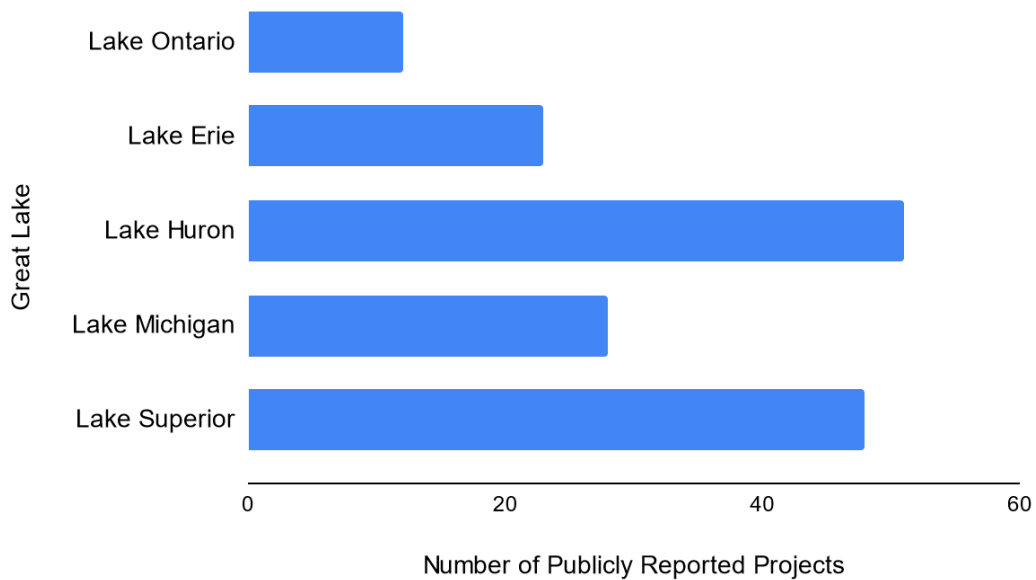


Fig. 12. Number of publicly reported Indigenous-Peoples related monitoring or research projects identified in the grey-literature review presented by geographic focus in the Great Lakes region (n = 162).

As is illustrated in Figure 12, the majority (51/162, 32%) of the publicly reported Indigenous-Peoples related monitoring and research studies within the Great Lakes region were conducted on, in or surrounding Lake Huron. Monitoring studies and research projects within Lake Huron and Lake Superior accounted for more than 60% (99/162) of the publicly reported work. Lake Michigan, Lake Erie and Lake Ontario each accounted for less than 20% of reported research and monitoring projects (i.e., 28/162, 17%; 23/162, 14%; and 12/162,7% respectively) identified and reviewed in the grey-literature review process for this project.

Table 4. Locations of publicly reported Indigenous-Peoples related research and monitoring projects within the Great Lakes region (n = 92).

Community	Nearest Lake	Number of Projects (n=93) ▼
Chippewas of Nawash Unceded First Nation	Lake Huron	25
Little River Band of Ottawa Indians	Lake Michigan	10
Sault Ste. Marie Tribe of Chippewa Indians	Lake Superior	10
Caradoc/ Chippewa of the Thames First Nation	Lake Erie	7
Red Cliff Band of Lake Superior Chippewa	Lake Superior	7
Fond Du Lac Band of Lake Superior Chippewa	Lake Superior	6
Akwesasne (Mohawk Council of Akwesasne & Saint Regis Mohawk Tribe)	Lake Ontario	5
Walpole Island First Nation	Lake Erie	5
Bay Mills Chippewa Indian Community	Lake Superior	5
Grand traverse band of Ottawa and Chippewa Indians	Lake Superior	3
Little Traverse Bay Bands of Odawa Indians	Lake Superior	3
Bad River Band of Lake Superior Chippewa Indians	Lake Superior	3
Garden River First Nation	Lake Superior	3

Within the Great Lakes region, 13 locations/communities were considered active locations for Indigenous-Peoples related research and monitoring if they were reporting three or more projects. These active communities publicly reported a total of 92 projects (Table 3). Chippewas of Nawash First Nation located within Lake Huron was the most active community for publicly reported Great Lakes research and monitoring (25/92, 27%). Overall, Lake Superior had the most communities (i.e., 8/13) that were active as relates to publicly reported Indigenous-Peoples research and monitoring. Collectively, the active communities within Lake Superior (i.e., Sault Ste. Marie Tribe of Chippewa Indians, Red Cliff Band of Lake Superior Chippewa, Fond Du Lac Band of Lake Superior Chippewa, Bay Mills Chippewa Indian Community, Grand traverse band of Ottawa and Chippewa Indians, Little Traverse Bay Bands of Odawa Indians, Bad River Band of Lake Superior Chippewa Indians and Garden River First Nation) had 40/92 of the publicly reported projects. Locations within or around Lake Erie and Lake Ontario were the least active (12/95 and 5/92 projects reported respectively).

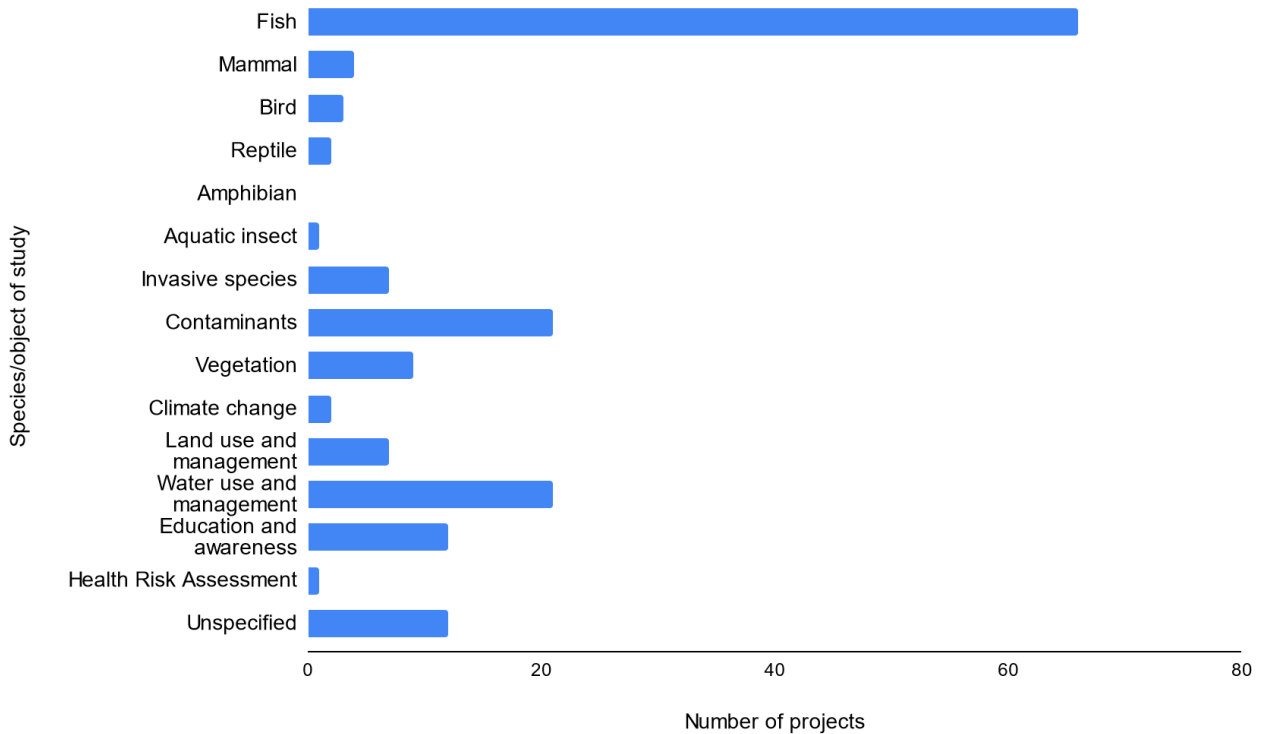


Fig. 13. Number of research and monitoring projects identified and analysed from the grey-literature, categorized by species/object of study (n = 162).

Research and monitoring were categorized based on similarities in the species/object of study. Some projects had more than one object of study (Fig 13). In some instances (i.e., 12/168) the object(s) of study were unspecified. Species and/or objects of study in the majority of the projects were fish (66/168, 39%) and contaminants (21/168, 13%) and water use and management (21/168, 13%). Research and monitoring on fish within the Great Lakes region were commonly based on fish ecology, fish habitat, and fish abundance. Studies examining contaminants in fish as well as effects of nutrients and/or chemical contaminants on the lacustrine environment and surface water were commonly captured within the category named Contaminants. Projects based on water use and management examined areas including water control structures, source water protection, and shoreline management. The following objects of study were the focus/objects of study of a smaller portion (i.e., less than 10%) of the research and monitoring projects: Education and awareness (i.e.12/168, 7%), vegetation (9/168, 8%), land use and management (7/168, 4%), invasive species (7/168, 4%), mammals (4/168, 2%), birds (3/168, 2%), reptiles (2/168, 1%), climate change (2/168, 1%), aquatic insects (1/168, 1%), health risk assessment (1/168, 1%).

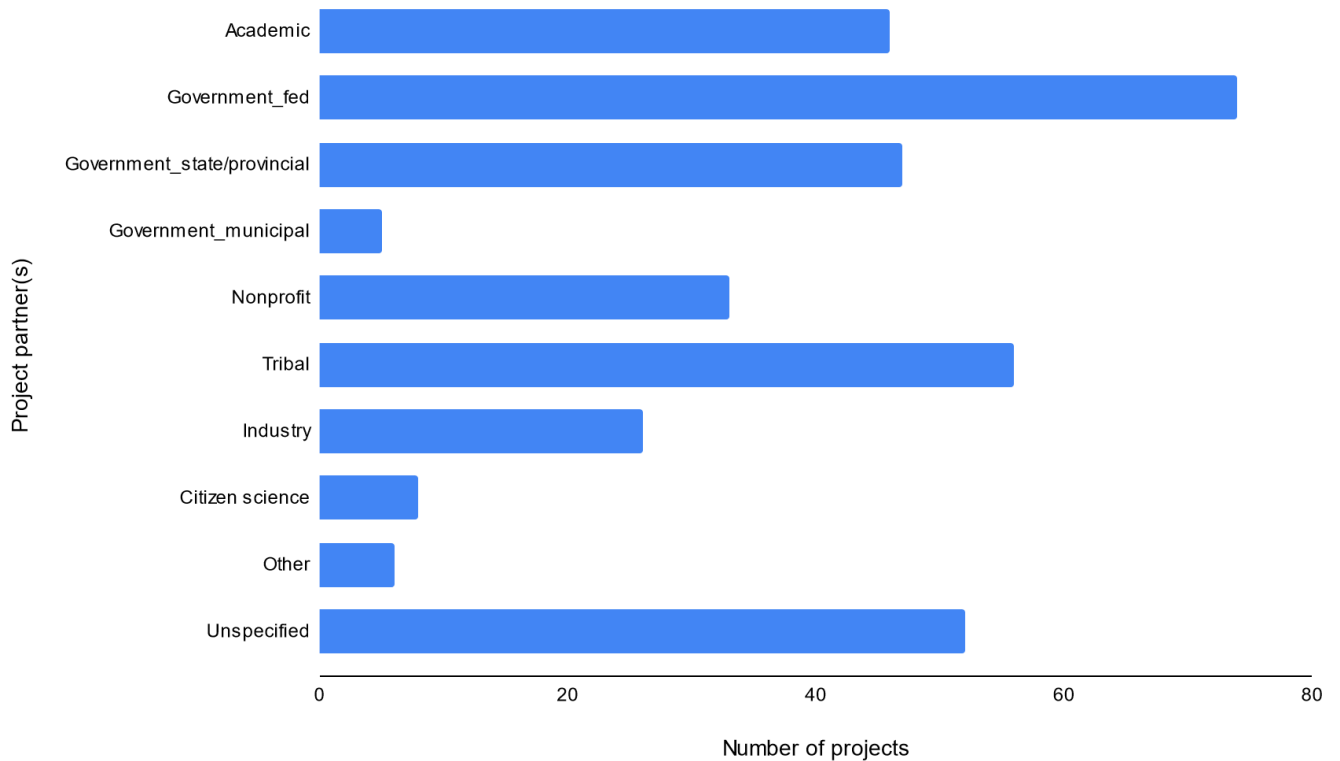


Fig. 14. Project partners involved in Indigenous-Peoples based research and monitoring projects within the Great Lakes region as reported in the grey-literature (n = 162).

Findings from the online grey literature review revealed 353 projects partners involved in Indigenous-Peoples related monitoring and research on, in or surrounding the Great Lakes (Fig. 14). It is important to note that some projects had multiple partners that could be classified under the same category. Government-fed (Federal Government partners in the United States or Canada) were the most commonly identified (i.e.74/353, 21%) project partners in this work. The following partners made up a substantial but smaller proportion (i.e.,>10%) of the partners working on Indigenous-Peoples based research and monitoring projects within the Great Lakes region: Tribal (56/356, 16%) , Government-State/Provincial (47/353, 13%), and Academic (46/353, 13%). The following institutions and organizations were identified as being involved in fewer publicly reported projects: Non-profit organizations (33/353, 9%), Industry (26/353, 7%), Citizens via citizen science (8/353, 2%), Other groups or individuals (6/353, 2%) and Government-Municipal (5/353, 1%). For 15% (i.e., 52/353) of the projects, project partners were unspecified.

Activity 2: Supplemental conversations with community/nation/organization representatives

Conversations with community/nation/organization representatives yielded findings significant to understanding limitations of the literature search processes and results. In addition, these findings provide insights into research funding sources and mechanisms, and the importance of data governance issues.

Research funding sources for research or monitoring activities of importance to Indigenous communities/organizations/Nations surrounding the great Lakes might include either Provincial, State and Federal Government, Academic (including federal government research funding through National Science Foundation (US), Natural Sciences and Engineering Research Council (Canada), Canadian Institutes of Health Research) sources, funds associated with Impact and Benefit Agreements (Canada), Industry, or internal community/Nation funding, or a combination of funding sources. Similarly, reporting requirements (e.g., publicly shared or published) can be for research and monitoring activities related to the Great Lakes in association with or of significance to Indigenous peoples can be diverse and is dependent on the funding source(s) for the activities.

Literature-based reviews of research activities related to Indigenous communities/Nations/organizations captures limited forms of classification of research and monitoring. Supplemental conversations conducted for this project to date have indicated that the peer-reviewed literature and grey literature searches missed past and current activity; some research activity of priority to Indigenous communities/Nations/organizations is not made public for valid and important reasons. These reasons can be related to data governance and a community/Nation/organization's need to protect sensitive information and land- or water-based knowledges specific to a community or Nation, among other things.

Findings from supplemental conversations emphasize the need to conduct the survey of practitioners identified in the grey literature search process and contacts from other communities/Nations/organizations identified by the project team and GLOS to assess how widespread literature-identified priorities and emphases of activity are surrounding the Lakes. Further, it is important to gather information on community/organization/Nation's perspectives on future priorities and data needs, as well as preoccupations relating to issues of data governance and sovereignty highlighted in some supplemental conversations.

Activity 3: Online survey on Indigenous community/organization/Nation perspectives on Great Lakes research, monitoring, data needs and priorities for the future

Results of the online survey are presented and discussed in graphic and narrative form below. A copy of the survey questions are included in Appendix B.

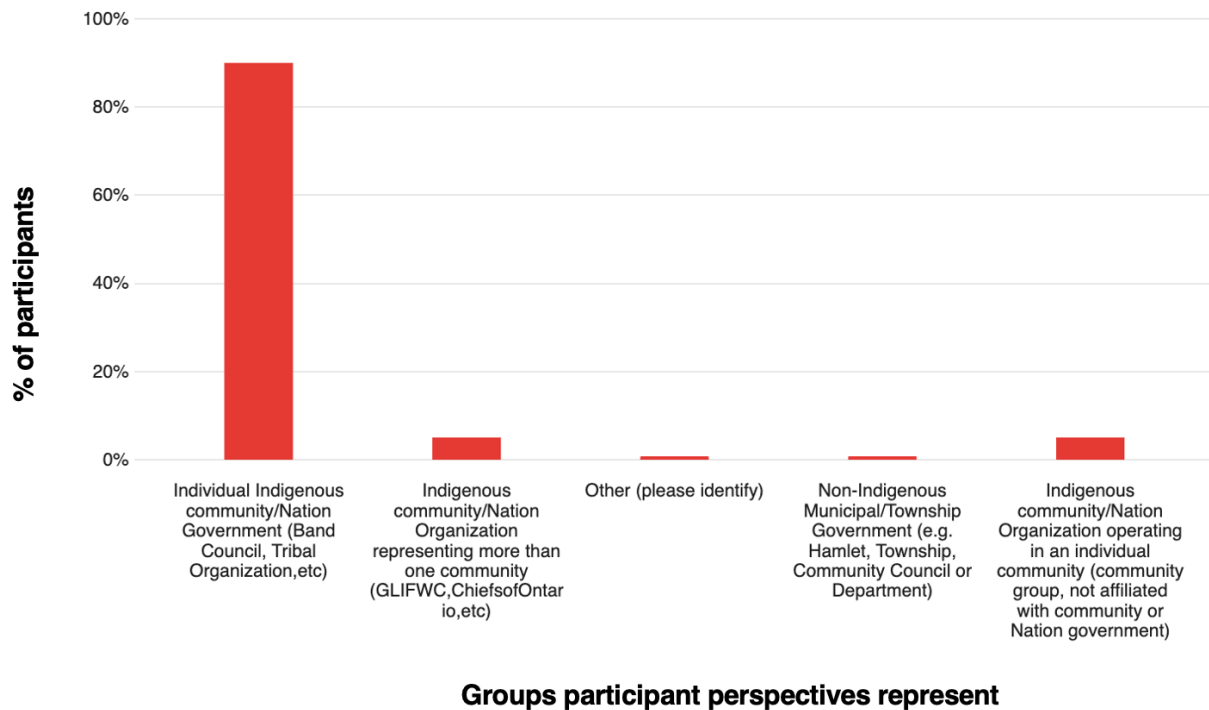


Fig. 15. Groups represented in survey responses (N=20).

The large majority of respondents represented perspectives from individual Indigenous community or governance entities, while a significantly smaller number represented perspectives from a non-governance related entity in a community or an organization representing a collective Indigenous communities, Bands, Tribes or Nations.

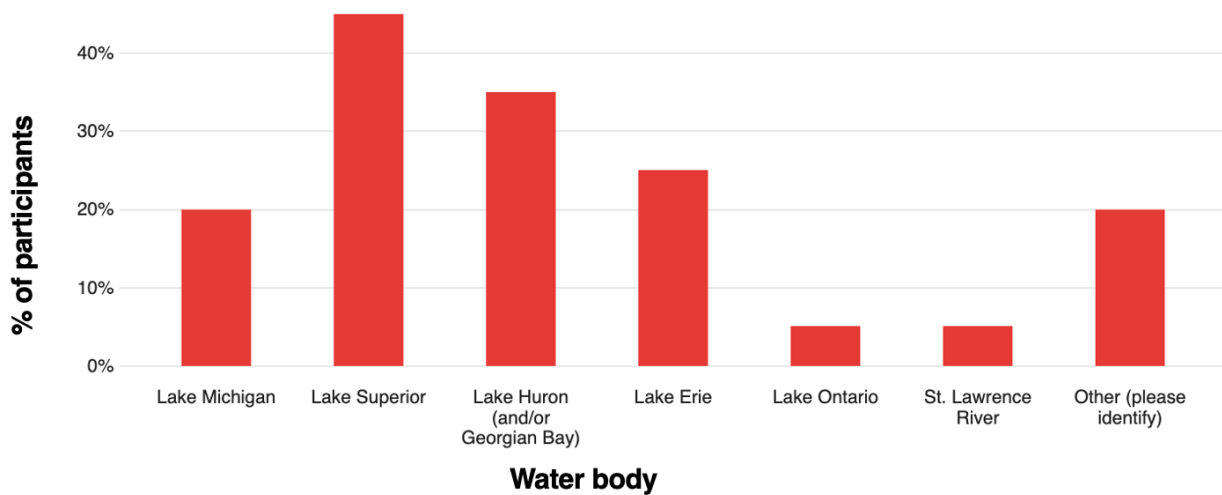


Fig. 16. Great Lakes water bodies nearby that participants' community/Nation/Organizations conducted research/monitoring in relation to (N=20).

The majority of respondents represented groups working in Lake Superior, followed by Lake Huron and Lake Erie. Few responses were received from respondents representing work conducted in Lake Ontario. "Other" responses mentioned by participants included the Detroit River, Lake St. Claire, St. Claire River, Grand River, and the St. Mary's River.

Participants were asked if their community/nation/Organization had participated in any research or monitoring activities in (or associated with) the Great Lakes in the last 10 years. Eighty percent (n=16) of participants indicated that this was the case, while 20% were unsure based on their own knowledge. All further questions in the survey were only asked to those 80% of participants indicating that they were aware of research or monitoring being conducted by their community/Nation/Organization related to or in the Great Lakes in the last 10 years.

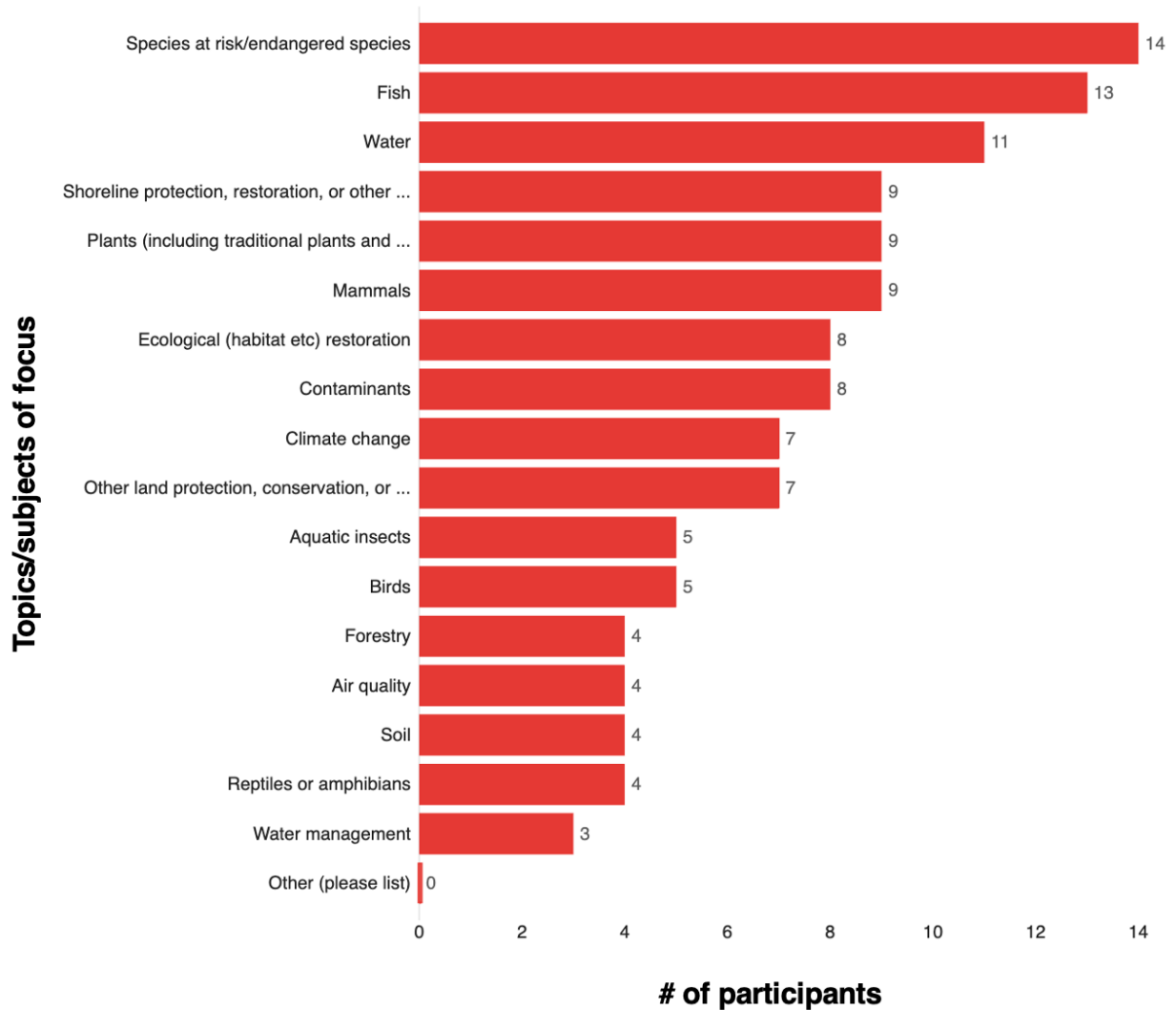
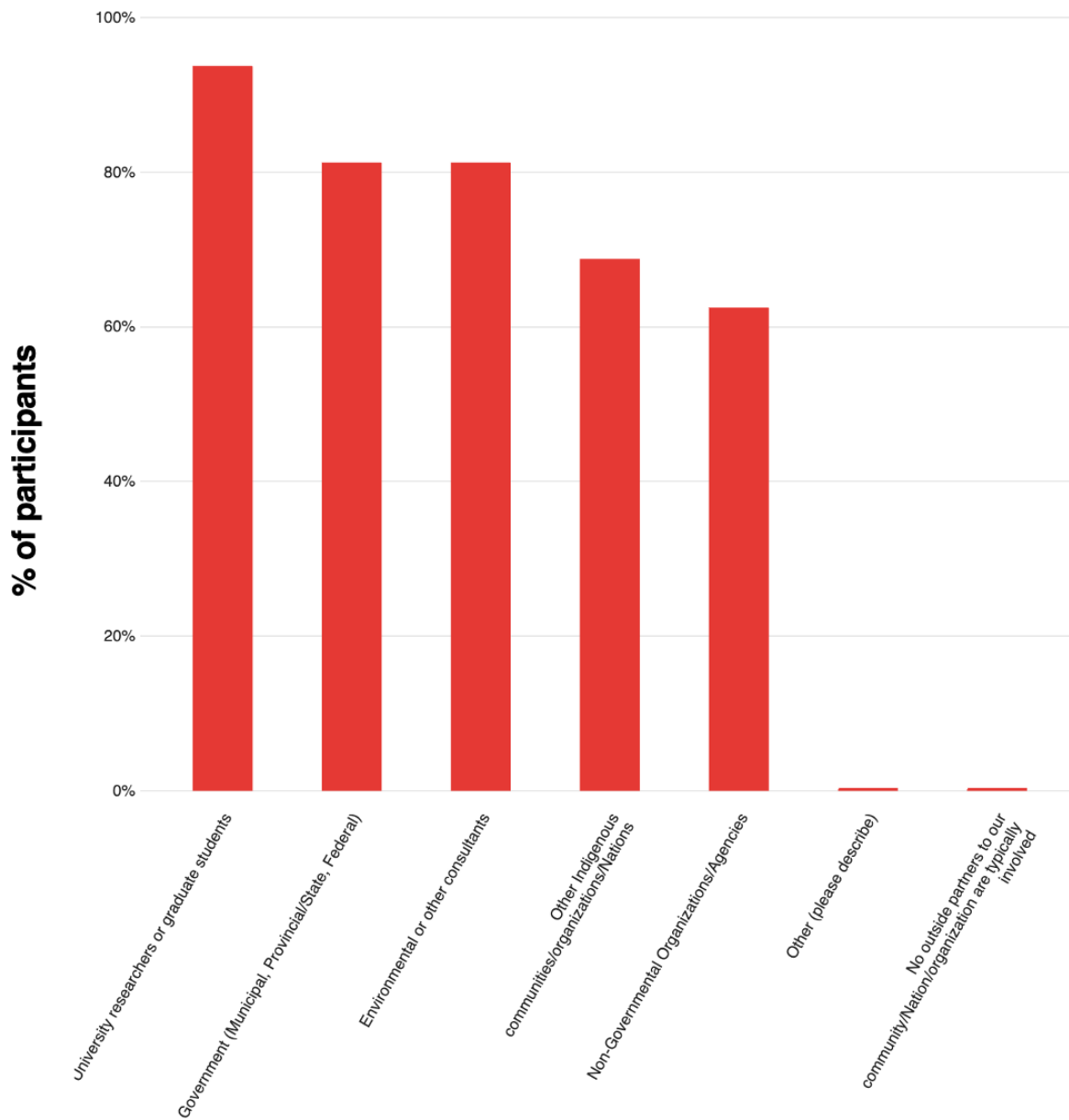


Fig. 17. Topics/subjects of focus of previous work in the last 10 years (N=16).

The most commonly reported area of focus for past research/monitoring was species at risk/endangered species followed closely by fish and then general water issues. Only a very small number of participants (n=3) indicated that their community/Nation/Organization had conducted work on water management issues previously in the Great Lakes.



Project partner identification

Fig. 18. Partners that communities/Nations/Organizations have collaborated or partnered with in Great Lakes research or monitoring in the past 10 years (N=16).

When asked about the type of partners groups had worked with on this research or monitoring in the past 10 years, the most common partner identified was University researchers or their graduate students, followed by Government or Consultants. No respondents indicated that the work they were involved in was done solely by their own community/Nation/Organization.

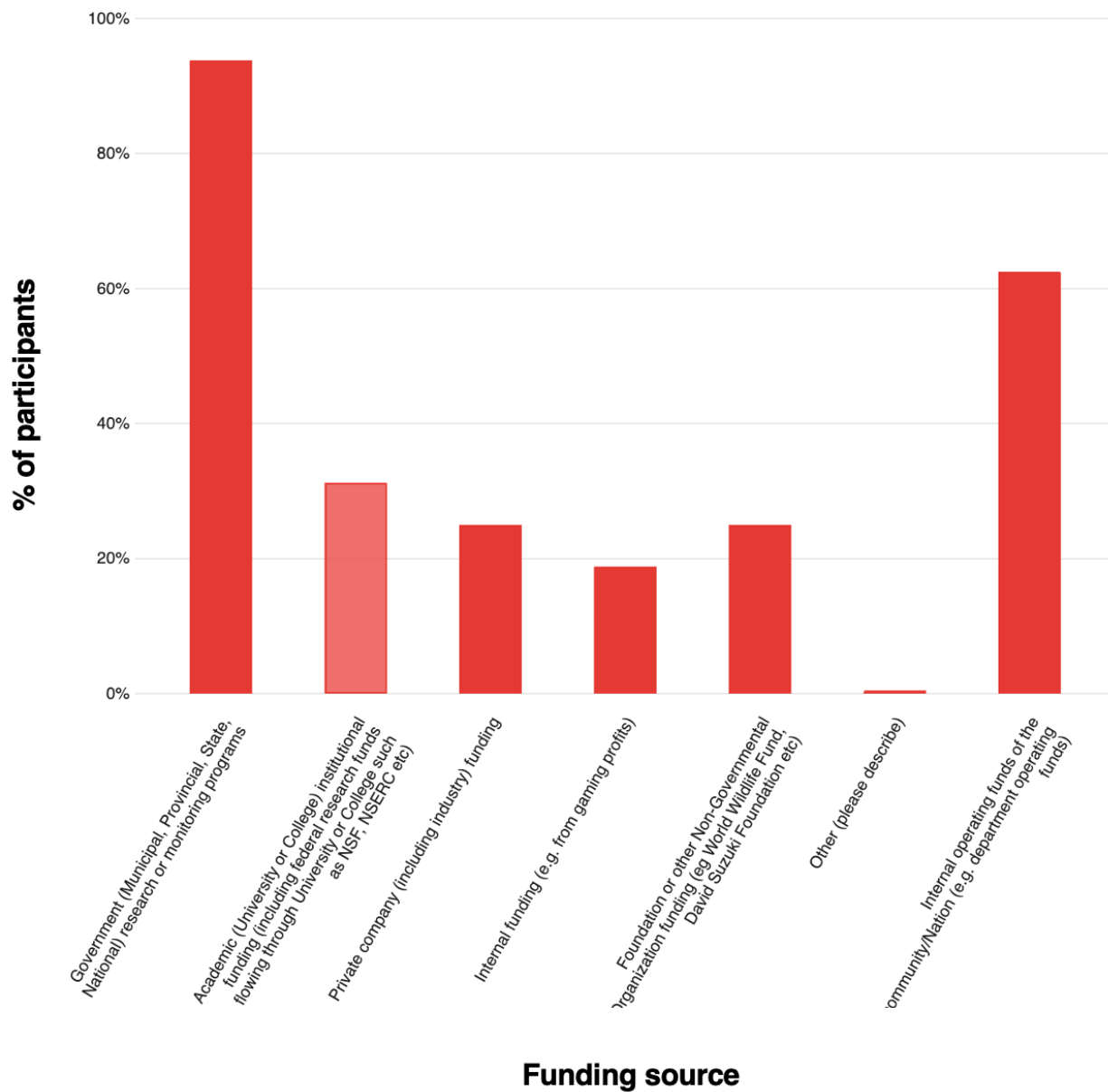


Fig. 19. Sources of funding used to support previous research/monitoring in the Great Lakes (N=16).

Nearly all participants indicated that they had used Government funds to support previous work, while internal operating funds (e.g. operating budgets of community councils, organization departments etc) were reported by 60% of participants.

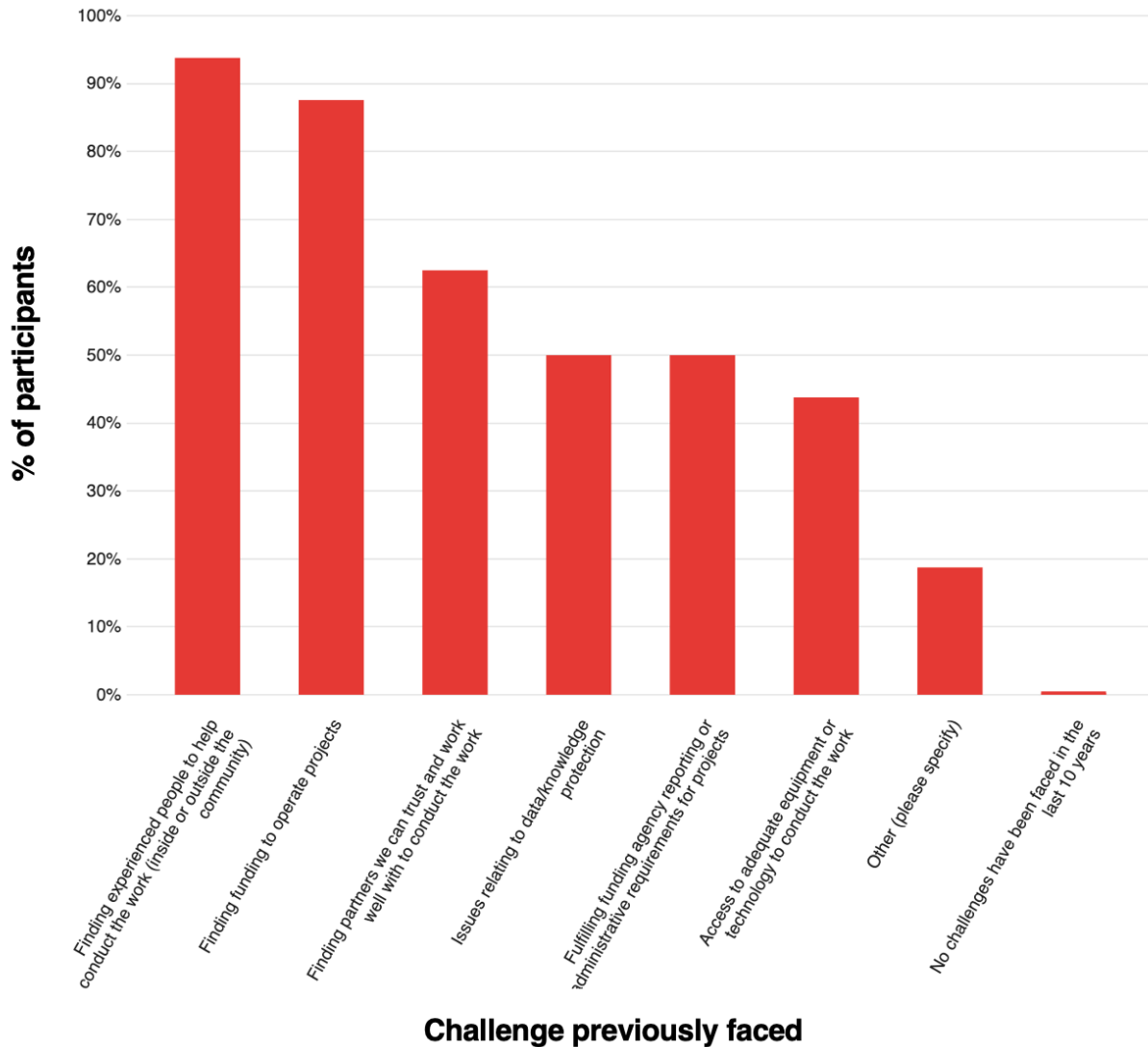


Fig. 20. Challenges previously faced in Great Lakes research or monitoring activities in the last 10 years (N=16).

All participants indicated some challenges in previous research and monitoring activities over the last 10 years. The most commonly reported were finding experienced people to conduct the work, sourcing funding to support the projects, or finding partners to work with that were trustworthy. Half of participants reported challenges associated with data or knowledge protection or fulfilling funding agency requirements for reporting or administration as challenges previously faced. Among those identifying "other" challenges, they reported distance to project areas, multiyear funding access, high turnover rate of personnel in community, issues with ethical review boards at academic institutions, distrust or lack of understanding of Indigenous Knowledge by outside partners, and lack of focus or respect on community interests in research and decision making by outside researchers.

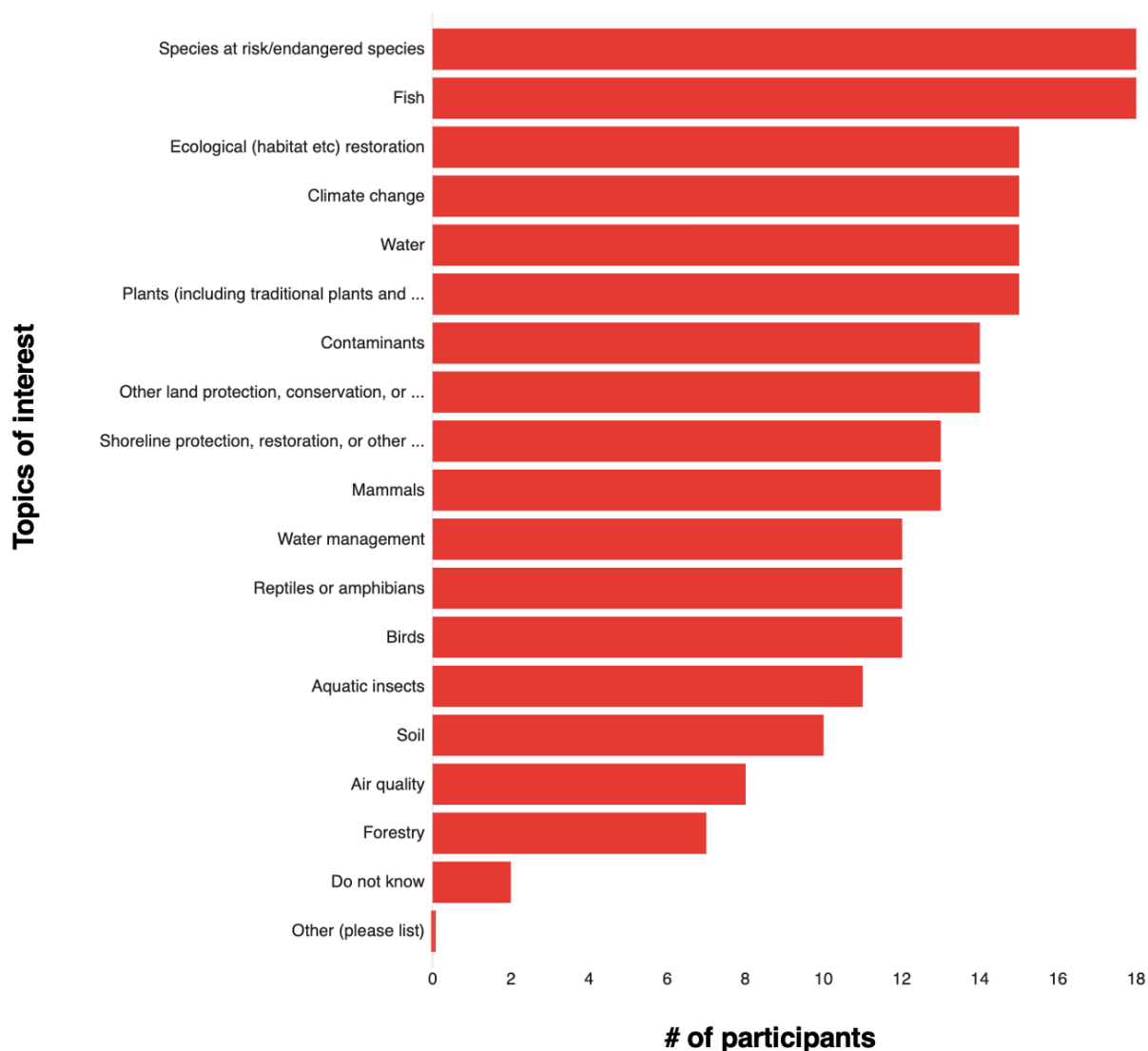


Fig. 21. Current and future (over the next 5 years) topics/subjects of interest in research or monitoring on or around the Great Lakes (N=16).

All participants (N=20) were then asked to identify areas of interest/priority for their community/Nation/Organization in terms of future research and monitoring in the Great Lakes. The most commonly reported priorities were those that had been the focus of past work, namely species at risk/engaged species, and fish. These topics were closely followed by ecological (e.g. habitat) restoration, climate change, general water issues and research/monitoring on plants (including traditional plants and medicines).

When asked if there were any other data needs of their community/Nation/Organization related to the Great Lakes and the environment in their Territory, participants identified the following:

- Temperature data
- Traditional uses on the lakes
- Traditional Knowledge regarding commercial fishing
- Online storage of data
- Impacts of stocking non-native fish
- Jurisdiction, lakebed title/claims
- Infrastructure effects (e.g. lakebed pipelines) and fugitive emissions and effects
- Icebridge formation
- Mapping/digital imagery collection including bathymetry and substrate/habitat data
- Invasive species control

While some of these topics fall into the general categories provided in the survey, the detailed responses provide further specificity and some examples of priorities under those topics. The survey then asked all participants about any concerns they and the groups they represented may have regarding data/knowledge management and protection. When asked if their community/Nation/Organization had any concerns in this regard Knowing the current discourse on Indigenous data sovereignty and management 65% responded "yes", 20% responded "no" and 15% were unsure.

When asked if they typically cooperate and work with other Indigenous communities/Nations/Organizations on their Great Lakes-related research and monitoring initiatives, the large majority of respondents (80%, n=16) indicated that they did, while 15% (n=3) were unsure and only 1 reported that they did not. The nature of cooperation reported by participants between Indigenous groups ranged from proposal writing and seeking funding together, to working cooperatively on initiatives in the field, sharing expertise and personnel, data and information sharing, or simply communication on topics of common interest. The nature and extent of formalization of cooperation varied considerably by participant with some referring to more informal cooperative arrangements and others citing data sharing requirements among Tribes and the State.

Finally, when asked if their community/Nation/Organization would be interested in discussing other ways or better ways to collaborate with other Indigenous communities/Nations/Organizations around the Great Lakes on research and monitoring in the future, there was clear support for this from a majority of respondents with 75% of participants responding "yes" and the other 25% indicating that they were "unsure" at this time.

Conclusions

The survey provides greater detailed information on past community/Nation/Organization participation in Great Lakes research and monitoring. While having a Lake Superior and Huron focus in responses, it indicates a past and future interest or prioritization in research and monitoring on species at risk/endangered species and fish in the Great Lakes. Survey respondents reported that the vast majority of past work has been conducted in collaboration and not solely by an individual community/Nation/Organization. The most common partners for this work with Indigenous communities are university researchers, followed by government representatives at various levels. Interestingly, the most common source of funding for this work was not University or academic sources but government sources. Greater than half of all respondents indicated challenges to this work in the past included finding experienced and trustworthy partners to conduct the work and finding adequate sources of funding. These are both challenges that may benefit from support by an outside entity or trusted partner of Indigenous groups in various regions around the lakes. Issues of data protection, management, and sovereignty are critical going forward, however the majority of participants indicated an interest in discussing ways to collaborate with other Indigenous groups around the Great Lakes on research and monitoring in the future. These findings are supportive of further discussion and exploration with Indigenous groups around the Lakes regarding ways that GLOS may support their future research and monitoring interests and needs.

Recommended next steps

The following activities are recommended next steps based on the results to date from activities conducted under this project. This project was initially proposed as a three phase endeavour. We recommend continuing to pursue Phase 2 and 3 upon reflection of results obtained from Phase 1. Brief descriptions of Phase 2 and 3 are provided below.

Phase 2:

- Deliver results from Phase 1 back to the organizations and communities identified in Phase 1 through online (e.g. Zoom) presentations.
- Develop in-person (and virtual) workshops for further understanding community and organization needs regarding current and future information and data needs, and priorities regarding Great Lakes Research and monitoring activities and to gage interests in, and needs for / expectations in engagement (if there is interest) in a collective Indigenous-directed Smart Great Lakes initiative. Workshops will include engagement around project findings from Phase 1 and the consideration of a future Indigenous-led initiative

associated with the Smart Great Lakes program. These sessions will be recorded and session summaries will be provided to all participants and included in final project reporting

- Deliver workshops at multiple locations around the Great Lakes and online (as deemed feasible and effective)
- Synthesize and analyse (identifying common issues raised and patterns in narrative data shared) workshop transcripts and prepare and present a report of findings from workshops to GLOS and participants to determine if there is interest in pursuing the development of a collective Indigenous-directed Smart Great Lakes initiative

Phase 3:

- Design and conduct workshops to envision what the collective Indigenous-directed Smart Great Lakes initiative could look like, what its focus could/should be and how it might operate
- Explore key data governance and sovereignty issues and processes, potential to use process as teaching tool and resource regarding how to authentically engage Indigenous communities (tribes, nations, Métis, and other underserved communities. iSGLi to be platform to facilitate data governance and sovereignty.
- Upon completion of Phase 3, it is anticipated that participating Indigenous communities/organizations/Nations would determine and lead future steps of creating and implementing a shared vision.

Applications

Outputs

New fundamental or applied knowledge

No new fundamental or applied knowledge was generated via this project

Scientific publications

The project has submitted one scientific manuscript for publication on the peer-reviewed literature search protocol for examining and synthesizing research and monitoring activities pertaining to Indigenous communities, organizations and Nations in the Great Lakes region. A second manuscript will be prepared and submitted presenting the results of this systematic mapping review of the literature.

Presentations

Key members of the team were invited and participated in several outreach activities associated with the work under this project. These included media presentations, workshop design and convening, and participation on scientific panels at conferences. These activities are listed below.

- Project Co-Lead Dr. Wall was featured with a panel in Ontario, Canada TVO's program the Agenda, Making the Great Lakes Smarter: bringing smart technologies to the Great Lakes, January 18, 2022 (see: <https://www.youtube.com/watch?v=JhlvrXHUVr4>).
- In collaboration with GLOS, our project co-leads hosted a Town Hall focused on Indigenous and non-Indigenous Cooperation, and knowledge system collaboration at the AGU Ocean Sciences Meeting 2022, titled, "Creating a Deeper Understanding of the Oceans and Great Lakes: Indigenous and non-Indigenous Cooperation, Approaches, and Methods, Hawaii, USA". The virtual Town Hall was held on February 24, 2022. Our team recruited and convened four experts from different regions around the world, all with extensive experience on this topic, to participate in this session. The four guests were: Manulani Meyer (University of Hawai'i), Barbara Wall (Trent University), Bradley Moggridge (University of Canberra) and Henry Huntington (Ocean Conservancy, Alaska) (see: <https://osm2022.secure-platform.com/a>).
- Dr. Wall also participated as a panel member with Ocean Networks Canada's "Indigenous Partnerships for a Sustainable Ocean" innovative virtual session at the Ocean Sciences Meeting 2022. The panel discussion, titled "Indigenous Partnerships for the UN Ocean Decade: Perspectives from Canada," took place on March 3, 2022 (see: <https://osm2022.secure-platform.com/a>).
- Dr. Buell presented at the GLOS annual meeting (April 2022) as a panel member for "How Can We Bring the Smart Great Lakes Vision to Life?" Glosapalooza, Chicago, Illinois, USA (see: <https://glos.org/glosapalooza/>)

Management outcomes - I

Opportunities outlined in the application section of this report created platforms for our team members to share their experiences and perspectives on the equitable inclusion of Indigenous perspectives and Knowledges at both the Great Lakes and global scales. These outcomes are far-reaching as multiple attendees provided feedback and were grateful for the insights shared. It is

anticipated that these types of impacts or contributions to management will continue through the sharing of project results in the form of publications, presentations, and other forms of outreach and knowledge mobilization.

Management Outcomes – II

While the long-term vision or goal of this project may lead to opportunities for greater Indigenous involvement and direction of Great Lakes-related research and monitoring efforts and access to data and information, it is premature at this time to speculate on impacts of this nature.

Evaluation

The project goal of gaining an understanding of the research and monitoring projects related to and/or involving Indigenous communities/Nations/organizations within the Great Lakes region was achieved and gaps in the accessibility of research projects were identified. The peer-reviewed and grey literature searches captured only publicly reported research and monitoring projects and therefore should be interpreted with caution as a representation of all activities having taken place in the Great Lakes by, with or relevant to Indigenous communities and organizations. Supplemental conversations with representatives of Indigenous communities/Nations/organizations indicate that some degree of research activity of priority is not made public and remains within communities/Nations/organizations for their own use. Certain research activities and/or findings are protected information and might not be accessible to those outside communities/Nations/organizations. The findings of the supplemental conversations informed an adaptation of the survey to include additional areas of focus and questions on data management.

Supplemental conversations and anticipated findings of the survey suggest a need for further exploration of communities/Nations/organizations' priorities and the likely importance of data sovereignty and governance issues when moving forward towards the consideration of an Indigenous-led Smart Great Lakes Initiative.

The project goals of understanding the interests, priorities and needs of communities/Nations/organizations has not yet been fully achieved. As identified previously, the survey will continue to gather responses until July 30th, and is likely to yield important results to help achieve this final goal.

References

Haddaway NR, Macura B, Whaley P, Pullin AS. (2018). ROSES Reporting standards for systematic evidence syntheses: pro forma, flow-diagram and descriptive summary of the plan and conduct of environmental systematic reviews and systematic maps. *Environ Evid.* 2018;7:7.

Smart Great Lakes Initiative Strategic Plan (2020-2025). Retrieved from
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Appendix A

Supplemental Conversations: Past, current, and future environment-related projects/research in the Great Lakes involving Indigenous Peoples

SECTION ONE: Participant Information

1. Please indicate the name and type of entity (community/Nation/Organization/ etc) that you work with/for.
2. What is / are the Great Lakes water body(ies) that your community/Nation/organization does monitoring or research in relation to? (e.g. L Ontario, Erie, Huron, Superior, Michigan, St. Lawrence River, Other)
3. Where is your community/Nation/organization located?

SECTION TWO: Project Activity Information

1. A) Has your community or organization been involved with or led any environment-related projects, research or initiatives (monitoring, research etc) involving the Great Lakes? (Yes/No)
2. B) If yes, I will first list projects we have already identified via our online search that your community/Nation/organization has been involved in, then ask you to please identify and describe others you are aware of that we do not currently have information on.

For each new initiative that I have not mentioned, please tell me about the following:

- a. Timeline
 - b. Location
 - c. Intent/goal
 - d. Activities involved
 - e. Reports or communication produced and their public accessibility (or not)
 - f. Funding source(s)
 - g. Data management (was data gathered and if yes, where is it stored and who manages that data)
 - h. Is it possible to include this information in the publicly accessible inventory of projects being developed for this project
3. In general, have experienced any challenges when trying to implement projects/initiatives related to the Great Lakes? If yes, what have they been and how have you addressed them?
 4. Where do the research/monitoring results end up (academic publications, internal reports, data verbally shared within your organization or community with leadership only etc)? and why?

5. What are some interests/ priorities your community/Nation/organization has in terms of conducting future monitoring / research/ projects involving the Great Lakes?

Thank you very much for your participation!

Appendix B

Qualtrics Survey: Indigenous Perspectives on Great Lakes research and monitoring

Introduction

Thank you for your interest in this study on Indigenous community/Nation/Organization involvement, interest and priorities related to research and monitoring around the Great Lakes. It is being conducted by researchers at the Indigenous Environmental Institute (IEI) at Trent University and is funded by the Great Lakes Observing System (GLOS). This survey aims to gather perspectives from Indigenous community / Nation / Organization representatives around the Lakes. The results have the potential to inform future opportunities for cooperation between Indigenous communities and groups on Great Lakes related research.

The survey should take you approximately 10-15 minutes to complete. Upon completion of the survey, you will be asked to provide your email contact information so that you can be compensated for your time with a payment of \$50. Your email address and name will not be used in any way in association with your responses and will be kept confidential.

Please be sure to review the consent form included in the email you received with the survey link before proceeding.

Thank you in advance for participating in this questionnaire!

Q1 Have you read and understood the consent information provided in the Information Letter and Consent form attached to the email you received for this project?

- Yes, I received and have read the information contained in the Information Letter and Consent form included in the email for this survey
- No, I did not receive or read the information contained in the Information Letter and Consent form for this project included in the email for this survey

Skip To: End of Survey If Have you read and understood the consent information provided in the Information Letter and Conse... = No, I did not receive or read the information contained in the Information Letter and Consent form for this project included in the email for this survey

Display This Question:

If Have you read and understood the consent information provided in the Information Letter and Conse... = Yes, I received and have read the information contained in the Information Letter and Consent form included in the email for this survey

Q2 If yes, do you understand the information provided to you in the project Information Letter and Consent form (if you have any questions, please contact the individuals identified on the Information Letter and Consent form) and do you agree to participate in this voluntary survey?

- Yes
- No

Skip To: End of Survey If If yes, do you understand the information provided to you in the project Information Letter and C... = No

Display This Question:

If If yes, do you understand the information provided to you in the project Information Letter and C... = Yes

Q3 Please indicate what type of group you represent (please select one):

- Individual Indigenous community/Nation Government (Band Council, Tribal Organization,etc)
- Collective Indigenous community/Nation Organization (GLIFWC,Chiefs of Ontario,etc)
- Individual Indigenous community/Nation Organization (non-governmental)
- Non-Indigenous Municipal/Township Government (e.g. Hamlet, Township, Community Council or Department)
- Other (please identify) _____

Q4 What is/are the Great Lakes water bodies that your community/Nation/Organization does monitoring or research in relation to/near? (please select all that apply)

- Lake Michigan
- Lake Superior
- Lake Huron (and/or Georgian Bay)
- Lake Erie
- Lake Ontario
- St. Lawrence River
- Other (please identify) _____

Q5 All questions in this survey that ask about past research and monitoring activities are asking about activities in the last 10 years. Please answer to the best of your knowledge.

To the best of your knowledge, has your community/Nation/Organization been involved in (led, partnered, supported, conducted) any research or monitoring activities related to the Great Lakes in the last 10 years?

- Yes
- No
- Unsure

Skip To: End of Block If All questions in this survey that ask about past research and monitoring activities are asking ab... = No

Skip To: End of Block If All questions in this survey that ask about past research and monitoring activities are asking ab... = Unsure

Q6 If yes, what topics/subjects has this work been focused on in the last 10 years? (select all that apply)

- Fish
- Mammals
- Birds
- Reptiles or amphibians
- Aquatic insects
- Plants (including traditional plants and medicines)
- Forestry
- Soil
- Water
- Air quality
- Shoreline management
- Other forms of land management
- Ecological (habitat etc) restoration
- Water management
- Contaminants
- Climate change
- Species at risk/endangered species
- Other (please list) _____

Q7 What sorts of partners have you collaborated or partnered with in this work in the past 10 years? (please select all that apply)

- University researchers or graduate students
- Environmental or other consultants
- Non-Governmental Organizations/Agencies
- Government (Municipal, Provincial/State, Federal)
- Other Indigenous communities/organizations/Nations
- No outside partners to our community/Nation/organization are typically involved
- Other (please describe) _____

Q8 What sources of funding have you, your organization, community or Nation used to support this work in the last 10 years? (please select all that apply)

- Government (Municipal, Provincial, State, National) research or monitoring programs

- Academic (University or College) institutional funding (including federal research funds flowing through University or College such as NSF, NSERC etc)
- Private company (including industry) funding
- Internal funding (e.g. from gaming profits)
- Internal operating funds of the community/Nation (e.g. department operating funds)
- Foundation or other Non-Governmental Organization funding (eg World Wildlife Fund, David Suzuki Foundation etc)
- Other (please describe) _____

Q9 What challenges have you, your community, organization or Nation faced in leading, participating, or conducting this research or monitoring activity in the last 10 years? (Please select all that apply)

- No challenges have been faced in the last 10 years
- Finding funding to operate projects
- Finding experienced people to help conduct the work (inside or outside the community)
- Finding partners we can trust and work well with to conduct the work
- Fulfilling funding agency reporting or administrative requirements for projects
- Issues relating to data/knowledge protection
- Access to adequate equipment or technology to conduct the work
- Other (please specify) _____

Q10 What are the current and future (over the next 5 years) topics/subjects your community/organization/Nation is interested in conducting research or monitoring on around the Great Lakes? (select all that apply)

- Fish
- Mammals
- Birds
- Reptiles or amphibians
- Aquatic insects
- Plants (including traditional plants and medicines)
- Forestry
- Soil
- Water
- Air quality
- Shoreline management
- Other forms of land management

- Ecological (habitat etc) restoration
- Water management
- Contaminants
- Climate change
- Species at risk/endangered species
- Do not know
- Other (please list) _____

Q11 What other data needs does your community/organization/Nation have related to the Great Lakes and the environment in your Territory? If there are no more priorities other than what you identified in the last question, please respond with "none"

Q12 Does your community/organization/Nation have concerns about data/knowledge management (how data/knowledge gathered in your Territory is stored, protected, what it is used for, who it is accessed by etc)?

- Yes
- No
- Unsure

Display This Question:

If Does your community/organization/Nation work or cooperate with other Indigenous communities/organ... = Yes

Q13 If yes, what are some of the main concerns your community/organization/Nation has? (please explain)

Q14 Does your community/organization/Nation work or cooperate with other Indigenous communities/organizations/Nations on Great Lakes research or monitoring issues currently? (do you share data/knowledge, do you work cooperatively on projects or initiatives etc)

- Yes
- No
- Unsure

Display This Question:

If Does your community/organization/Nation work or cooperate with other Indigenous communities/organ... = Yes

Q15 If yes, can you please describe the nature of the cooperation? (e.g. sharing data? conducting the same project in both communities/Territories?, sharing research experts or partners?, searching for funding together as a larger team?, etc) (please describe)

Q16 Would you/your community/organization/Nation be interested in discussing other ways or better ways to collaborate with other Indigenous communities/organizations/Nations around the Great Lakes on research and monitoring activities?

- Yes - we would be interested in discussing what else is possible
- No - we have enough collaboration already or are not interested
- Unsure at this time

Q17 Thank you for completing this survey! For your time, we would like to offer you an honorarium of \$50. Please provide an email where you can be reached to arrange payment, if you would like to receive this honorarium. Your contact information or name will not be associated in any way with your survey responses, will always remain confidential, and will only be used to contact you for honorarium payment.

Supplementary File:

“I-SGLi-Final database from Peer-reviewed and grey literature searches”

https://docs.google.com/spreadsheets/d/1gr0V0tkhVpzqdX2EZMp5Nwm4SJuxHEHVUWbWsiOLu_w/edit?usp=sharing