

House of Commons Standing Committee on  
Environment and Sustainable Development  
**Study on Freshwater**

Brief submitted by DataStream Initiative

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**DataStream**

## Summary

DataStream Initiative is a registered charity that has dramatically improved the availability of water quality data in Canada over the past decade. Our comprehensive programming includes a **free open data platform currently used by more than 260 organizations to publicly share 39 million water data points** collected at over 51,000 locations. This includes community groups, governments, Indigenous nations, and academic researchers that are openly sharing data so that it can be put to use in research, policy and decision-making.

We welcome this opportunity to share our recommendations with the Environment and Sustainable Development Standing Committee for their study of freshwater in Canada. These recommendations are informed by a decade of experience in promoting open data and advocating for the inclusion of community voices in policy decisions that affect them. While it is anticipated that the Canada Water Agency will play a key role in advancing these recommendations, Environment and Climate Change Canada, Natural Resources Canada, the Department of Fisheries and Oceans, Health Canada and many other departments with mandates related to water will also be essential in achieving them in collaboration with non-governmental entities.

Summary of recommendations:

### **Community: Work with and support community-based monitoring**

- *Use community-based monitoring data to increase Canada's capacity for water quality assessment, informed decision making, and climate change adaptation.*
- *Create a priority investment category to provide long-term funding support (5+ years) for community-based watershed monitoring and restoration programming.*

### **Open data: Make water data collected with public funds open by default**

- *Fully implement departmental open by default policies so that all data collected using public funds are publicly available.*
- *Be consistent! Harmonize data across departments, programs, and jurisdictions by adopting the WQX standard for the Exchange of Water Quality Data.*
- *Invest in sustainable data systems and technology.*

### **Governance and coordination: Improve transparency and coordination of water activities in Canada**

- *The Canada Water Agency (CWA) provides a water "concierge service" – actively connecting people to the appropriate federal, provincial, territorial, and municipal bodies and Indigenous governments.*

### **Groundwater: Future-proof Canada's approach**

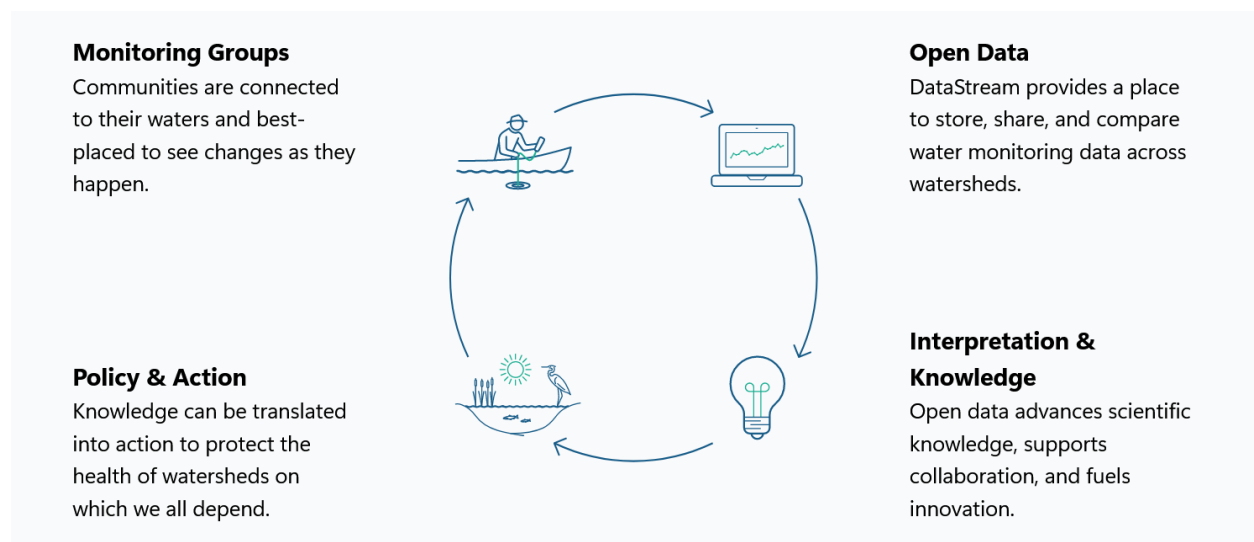
- *Modernize Canada's groundwater monitoring and management policies and practices to ensure Canada can address challenges including climate change.*

## Community: Work with and support community-based water monitoring

Across Canada, there is a growing movement of Indigenous and non-Indigenous community-based monitoring (CBM) and community science initiatives that are taking to their local waters to track and respond to environmental changes as they happen.

Through these efforts, communities and individuals with intimate local knowledge about the impacts of pollution, climate change, and other stressors are collecting vast amounts of data – sometimes spanning decades. And, when brought together, this data can generate powerful new insights across distances and timescales that are beyond the scope of any single monitoring initiative.

DataStream’s data-to-policy cycle (below) illustrates how community-based monitoring paired with open data can drive evidence-based policy making.



To realize the full potential of CBM and ensure that communities are meaningfully engaged in water decisions, a unified federal approach to CBM – including investment, resource support, and cross-sector partnership-building – is needed.

### CBM makes watershed health assessments possible

CBM programs answer questions about water quality and provide invaluable insights at local, regional, and even national scales. For example, while the [2020 WWF-Canada Watershed Reports](#) highlighted that the health of 60% of Canada’s sub-watersheds is unknown, it also illustrated the role that community-based monitoring groups play in filling gaps. In the Lower Mackenzie Watershed, for example, the region was deemed “data deficient” in 2017 but, thanks to community-based monitoring data that was made available on Mackenzie DataStream, it was possible to assess freshwater health for this region in the 2020 report.

The following recommendations build on and incorporate considerations from key reports on the status and benefits of community-based monitoring including:

- *Elevating Community-Based Water Monitoring in Canada (2019)*
- *A Business Case for Investment in Canadian Community-Based Water Monitoring (2021)*
- *Community-based Water Monitoring & Federal Commitment to Freshwater in Canada - 2021 joint submission to the Standing Committee on Environment and Sustainable Development for its study on freshwater.*

***We recommend: Use community-based monitoring data to increase Canada’s capacity for water quality assessment, informed decision making, and climate change adaptation.***

With limited government resources for water monitoring and a vast landscape to cover, a collaborative, all-hands-on-deck approach is needed to ensure we have the data needed to keep our watersheds healthy and resilient in the face of climate change. The federal government should better capitalize on high-quality water data collected by CBM programs.

A quick win for the federal government would be integrating CBM data into Canada’s reporting on Sustainable Development Goal 6.3.2 (“proportion of bodies of water with good ambient water quality”), filling gaps in the GEMStat global assessment on water quality.

#### **Where to start**

Develop a roadmap for using CBM data in national water assessment, management, and policy processes, where appropriate. Among other activities, the roadmap should:

- Inventory examples of effective use of CBM data (see US EPA case study below).
- Create and publicly communicate processes that use community-generated data in federal and other government water management activities.
- Provide technical support and guidance to address data quality concerns.
- Track and report ways in which CBM data is ultimately used. Communities collecting freshwater data benefit from seeing it used to guide decision making.
- Work with non-government actors to increase the availability of CBM data including through the continued expansion of DataStream’s open access platform.

### **Case Study: Regulatory requirements for use of community science data**

Under the federal [Clean Water Act](#), states, territories, and certain tribes must assess and report on pollution in their water bodies. The reality is that monitoring is resource intensive and costly, and many states are not able to meet reporting requirements.

To address these practical limitations in state-led monitoring, the EPA has required that states assemble and evaluate all **existing and readily available water data and information** – including data collected by community science programs:

*These organizations and groups should be actively solicited for research they may be conducting or reporting. States, territories, and authorized tribes must use such data and information in developing the CWA 303(d) list unless they provide a rationale not to. EPA will evaluate whether a state, territory, or authorized tribe provides a technical, science-based rationale for decisions not to use data or information.*

Thanks to the EPA's enabling policies, states have been able to increase the number of assessed water bodies within their borders. For example, the state of Virginia estimates that 20% of its data submitted to the EPA for Clean Water Act reporting requirements came from community-led water monitoring programs.

An analysis of volunteer monitoring and restoration efforts in Virginia suggests an annual monetary value of \$3.25 million. With the state's investment in these programs averaging below \$100,000 each year, these initiatives provide a substantial return on investment. Departmental engagement with participatory science is further enabled and guided by the [United States Crowdsourcing and Citizen Science Act](#).

***We recommend: Create a priority investment category to provide long-term funding support (5+ years) for community-based watershed monitoring and restoration programming.***

The new CWA would be a good fit to lead this work. It would support environmental organizations, watershed districts, community groups, Indigenous guardian programs, and researchers, among others. Priority should be on maintaining, and where applicable, expanding existing surface water and groundwater monitoring programs. Essential activities this investment category could support include the costs associated with high quality equipment and lab analysis, data management and sharing, and water quality reporting and community engagement.

For more information on this topic see:

- [Using Participatory Science at EPA: Vision and Principles](#)
- [Citizen Science Programs at Environmental Agencies: Case Studies \(2020\)](#)
- [Citizen science and the United Nations Sustainable Development Goals \(2019\)](#)

## **Open Data: Make water quality data collected with public funds open by default**

Open data is digital data that can be freely used, reused, and redistributed by anyone. Open data improves transparency and data reuse to advance scientific research, reduces duplication, and makes the most of public investments in research and water monitoring.

Currently, despite extensive water monitoring and research, there are significant gaps in our understanding of watershed health in Canada. For instance, in the 2020 global data drive for SDG indicator 6.3.2, which tracks the “proportion of bodies of water with good ambient water quality,” [Canada reported on the status of rivers](#) but has not reported on groundwater or open water bodies (lakes and reservoirs).

Where data exists, it is often siloed along sectoral lines, is not open, or is not in an accessible format.

The Federal Government’s [Directive on Open Government](#) states that “All data resources of business value held by Government of Canada departments are to be open by default and released as open data unless subject to valid exceptions...”. However, while access to federally collected water quality data has improved, more work is needed to make this commitment a consistent reality.

***We recommend: Fully implement departmental open by default policies so that all data collected using public funds are publicly available.***

Federally funded projects must take action to open up their data and be provided capacity-building support to help make this happen.

This would encompass water quality data that is generated, commissioned, or funded by federal departments – including but not limited to both surface water and groundwater data collected by external consultants, non-governmental organizations and academic institutions as well as data from environmental impact assessments and cumulative effects research. For example, from 2019-2020 alone, the Government of Canada invested over [\\$73 million in water-related research](#). To maximize the return on this investment, making the research data open access would facilitate broader reuse, fostering collaboration and informed action.

### **Where to start**

We recommend that a systematic review of water data collected by federal departments be ranked and given an openness rating. The recommendations and next steps from the 2021 [Data Needs in the Great Lakes](#) report provide more detail on potential ways forward in areas including institutional data policies and an open access culture shift. Advancing an open by default approach should include ensuring that data meets the [FAIR principles](#) (data are findable, accessible, interoperable and reusable) and setting clear, publicly available and transparent processes and timelines to achieve openness.

The CWA could champion this effort as part of Canada’s forthcoming Federal Water Data Strategy.

There may be occasions when it is not appropriate to make all data open, as it is vital to share data ethically in alignment with Indigenous data governance principles. These are the [principles of OCAP®](#) (ownership, control, access, and possession) and the [CARE principles for Indigenous Data Governance](#) (collective benefit, authority to control, responsibility, and ethics).

For more information on this topic see:

- [\*Toward the Creation of a Canada Water Agency: Stakeholder and Public Engagement - What we Heard \(2021\)\*](#). Recommendations in this report emphasize the need for well-defined procedures to ensure interoperability of datasets from diverse organizations.

***We recommend: Be consistent! Harmonize data across departments, programs, and jurisdictions by adopting the WQX standard for the Exchange of Water Quality data.***

[Data Standards](#) are documented agreements on representation, format, definition, structuring, tagging, transmission, manipulation, use, and management of data. Governments at all levels across Canada share water quality data in different formats and often do not adhere to existing data standards. This can make data challenging to work with.

In the United States, all water quality data collection funded by the federal government must be made openly available in the United States Environmental Protection Agency (EPA) Water Quality Exchange (WQX) data standard. Currently used [to share](#) over 380 million water result records from federal, state and tribal agencies, watershed organizations and other groups, it greatly improves data interoperability and re-usability.

The WQX data standard is well-established, continues to evolve, and is the result of over a decade of input from water scientists. This is the standard DataStream uses ([DS-WQX](#)).

### **Where to start**

Canada should adopt existing metadata and data standards, including the WQX standard for the Exchange of Water Quality Data, for publicly funded research and monitoring programs. This will help ensure datasets are interoperable and reusable and make it easier for diverse datasets to be used together to answer complex questions. The CWA could champion this effort as part of Canada's forthcoming Federal Water Data Strategy.

Data standardization would not only advance water management in Canada. Adopting WQX would represent a leap forward in Canada-USA management of transboundary waters—where lack of data harmonization is a pervasive challenge. In 2023, the International Joint Commission called for enhanced binational coordination in areas including “data interoperability and harmonization, standardization of sampling approaches, analytical methods and data interpretation” in the [\*Third Triennial Assessment of Progress on Great Lakes Water Quality\*](#).

***We recommend: Invest in sustainable data systems and technology***

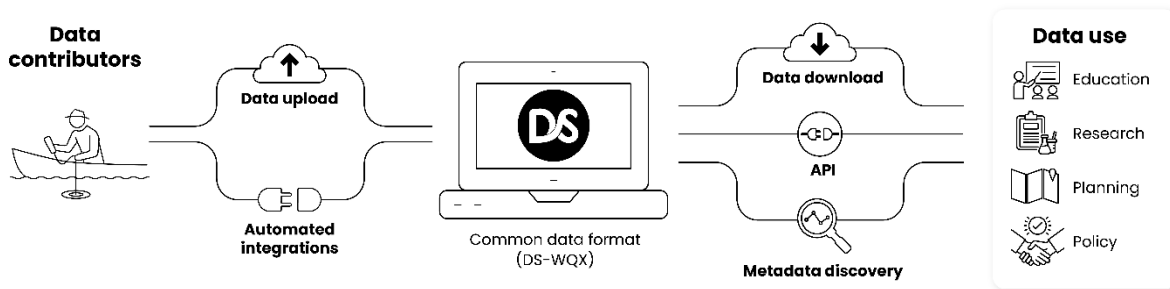
Best practice data management requires long-term financial and personnel commitments.

Core funding should be earmarked to support all stages of the data lifecycle, from data collection and quality control to data management, storage, and open sharing. To design and

manage effective data systems, funding must be provided to organizations with the expertise and experience required. Resources should support what is already working – to further develop and scale existing systems.

For example, DataStream supports a diversity of monitoring programs to securely store, share and access the data they need to make informed decisions. And, by providing datasets in standardized, analysis-ready formats, DataStream greatly reduces the cost and effort required to use data for different applications including modelling, AI, and data visualization.

DataStream has dramatically increased access to water data in Canada. As of January 2024, over 260 organizations were sharing 39 million data observations collected at 51,000 monitoring sites on DataStream. Much of this data would otherwise not be open and available to researchers, policy makers, and communities. More work is ahead, and investment needed, including to ensure that DataStream can serve communities from coast to coast to coast.



For more information on this topic see:

- [DataStream Data Governance Policy \(2022\)](#)
- [Toward the Creation of a Canada Water Agency: Stakeholder and Public Engagement - What we Heard \(2021\)](#)
- [2023–2026 Data Strategy for the Federal Public Service](#)
- [Environment and Climate Change Canada 2023-24 Departmental Plan](#)

## **Governance and coordination: Improve transparency and coordination of water activities in Canada**

Through our work with hundreds of diverse water organizations across Canada it is clear there is widespread confusion about where responsibility for different aspects of freshwater management lies, including responsibilities for groundwater and groundwater quality. At the federal level alone, over 20 departments and agencies have unique responsibilities with respect to water. This situation can result in both duplicated efforts and wasted investments, as well as delayed responses or, in some cases, no action at all.



***We recommend: The Canada Water Agency (CWA) provides a water “concierge service” – actively connecting people to the appropriate federal, provincial, territorial, and municipal bodies and Indigenous governments.***

The Canada Water Agency provides a once-in-a-generation chance to be a single point of contact signposting people to the information they need.

This work will help achieve the objectives of the CWA, which includes that it “makes it easier for Canadians and decision-makers to find federal freshwater resources” and “provides policy leadership and develops whole-of-government approaches to freshwater challenges and opportunities.” We are hopeful that the CWA can be the public face of water governance in Canada, addressing a key impediment to effective freshwater stewardship.

## **Groundwater: Future-proof Canada’s approach**

Conversations about water are often compartmentalized into discussions about surface water and groundwater resources. Or groundwater isn’t mentioned at all. In reality, surface water and groundwater are intricately connected, and groundwater is a fundamental source of Canada’s freshwater wealth. There is approximately ten times more groundwater than surface water in Canada, and groundwater is the largest source of liquid freshwater baseflow for all our major rivers. Recognizing the interplay between surface water and groundwater and better understanding groundwater resources is essential for effective water management.

Canadian researchers are world leaders in groundwater research, leading advancements in topics like groundwater flow and transboundary aquifers. However, this expertise hasn’t translated into mapping many of our own aquifers or contributing to cross-jurisdictional assessments. Simply put, we lack a comprehensive understanding of the quantity, location, and quality of Canada’s groundwater.

Given that about one third of Canada’s population relies on groundwater, it is crucial that we step up to the challenges facing this vital resource by investing in better – more coordinated – groundwater monitoring and management systems and enable data standardization and collation for future reporting (e.g., SDG 6.3.2). This need will only increase due to the impacts of climate change.

***We recommend: Modernize Canada’s groundwater monitoring and management policies and practices to ensure Canada can address challenges including climate change.***

Despite a history of collaboration on groundwater, Canada has failed to make significant progress on its approach to groundwater monitoring, management, and public education. For instance, even after 20 years, many of the goals outlined in the 2003 Canadian framework for collaboration on groundwater remain unmet. These goals include evaluating the status and trends of groundwater, establishing a permanent mechanism for inter-jurisdictional coordination, increasing public awareness of the importance of groundwater, and improving levels of funding.

There is a role for the CWA as a convener and facilitator with federal, provincial, territorial, municipal, Indigenous and community partners to advance progress on groundwater.

### **Where to start**

- Communicate the role and importance of groundwater as the primary source of Canada's liquid freshwater to enhance public awareness and encourage collaborative stewardship.
- Explore ways to bridge groundwater research-policy-practice gaps through mechanisms like the Freshwater Data Strategy and showing leadership on SDG 6.3.2 reporting.
- Foster cross-sector and cross-jurisdictional dialogue and strengthen existing collaborations on groundwater. For example, DataStream is working to adapt our open data schema to accommodate the unique needs of groundwater quality data using the WQX standard and align with other national and international groundwater data initiatives, such as the [Groundwater Information Network](#).
- Inventory and evaluate levels of government funding for groundwater monitoring and management and identify opportunities to increase and stabilize funding to levels commensurate with its value as a strategic resource.

For more information on this topic see:

- [\*Canadian framework for collaboration on groundwater \(2003\)\*](#)
- [\*Buried Treasure: Groundwater Permitting and Pricing in Canada \(2016\)\*](#)
- [\*The Sustainable Management of Groundwater in Canada \(2009\)\*](#)

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